THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXII. No. 1595.] LONDON, DECEMBER 5, 1893. [45TH YEAR. PRICE 6d.

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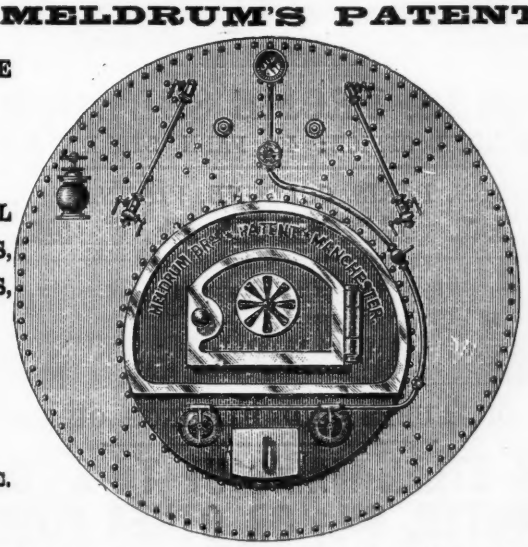

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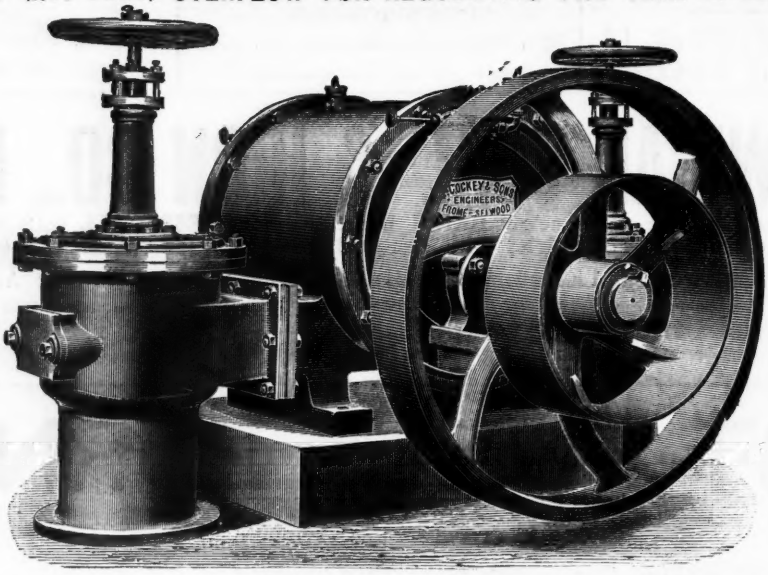

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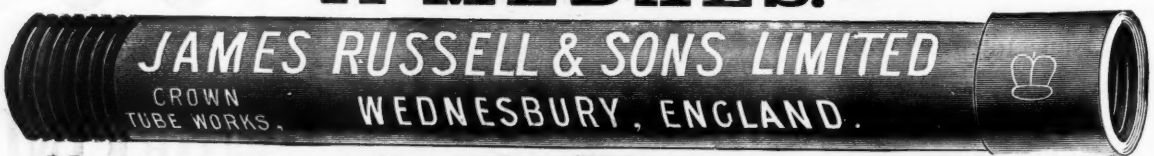

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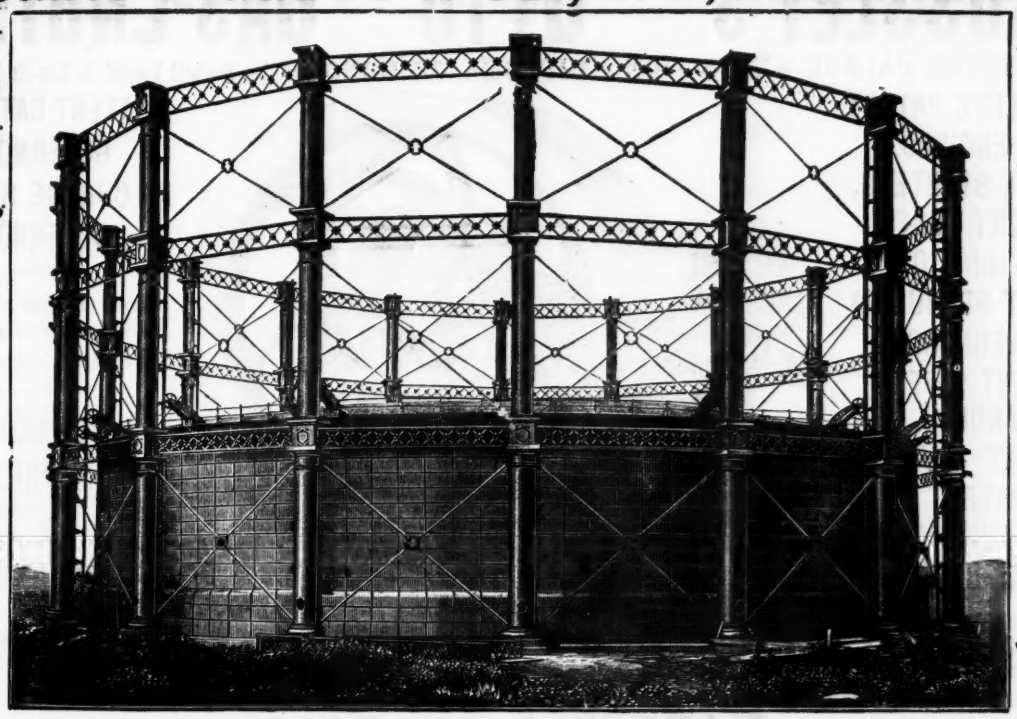

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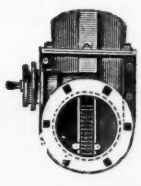

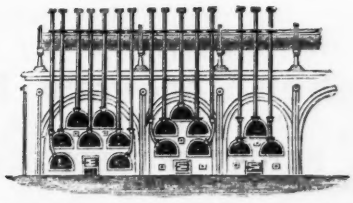

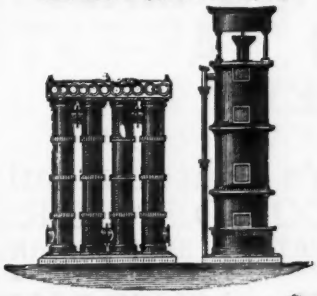

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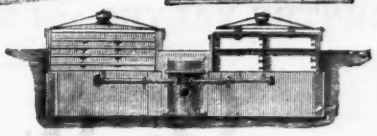

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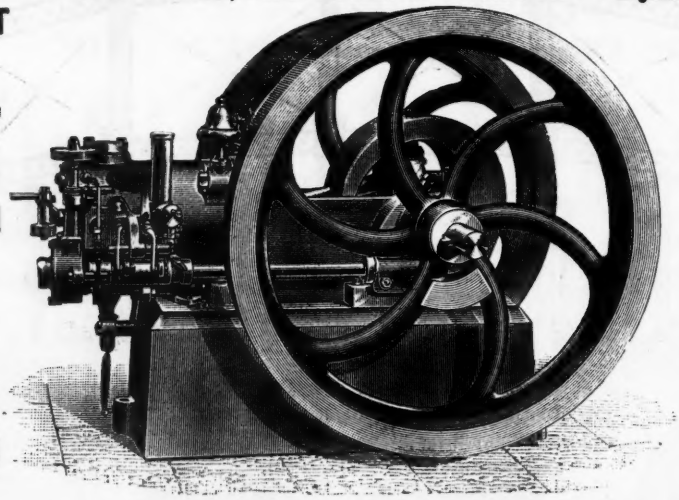

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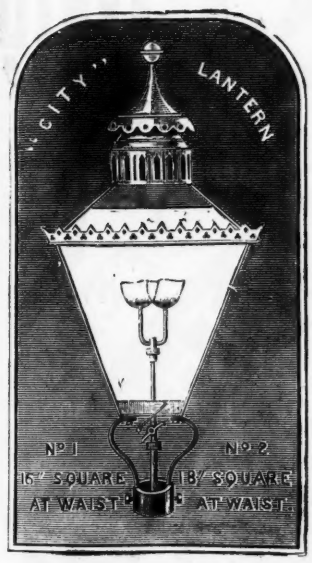

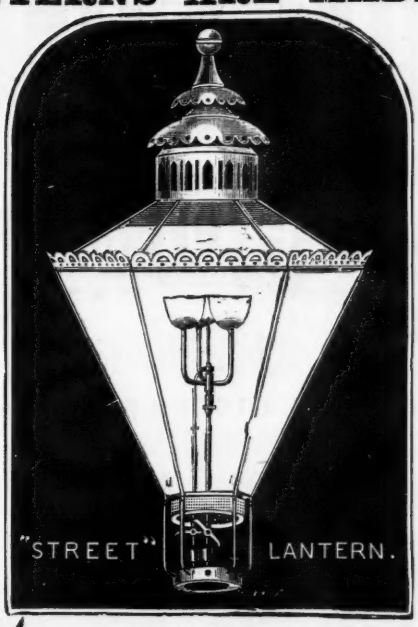

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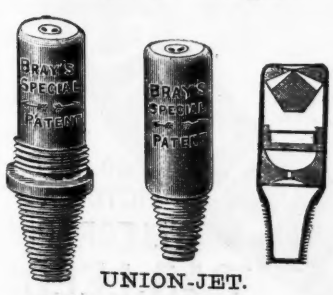

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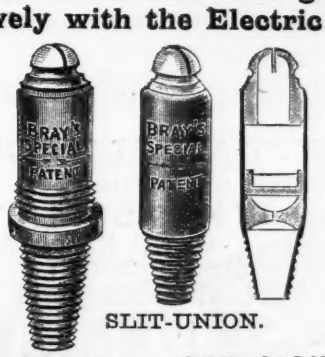

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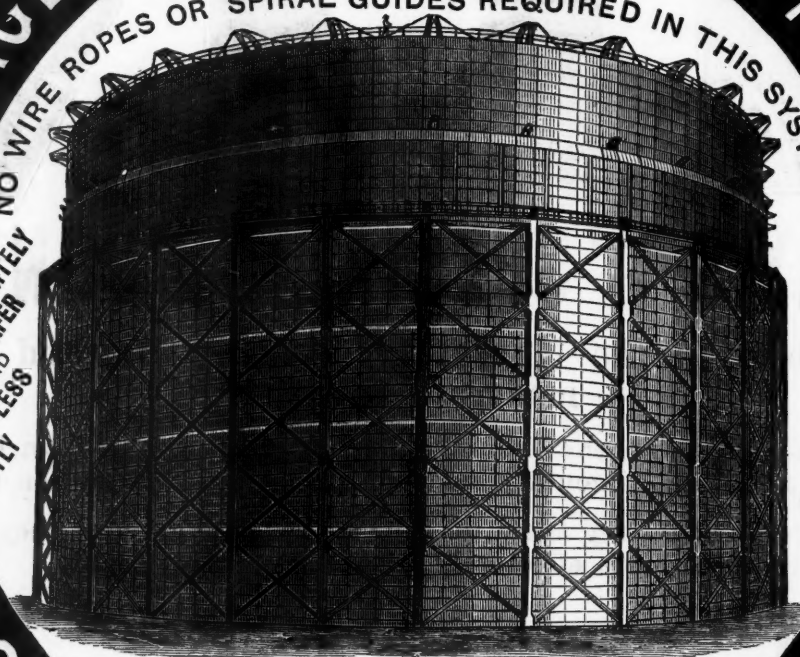

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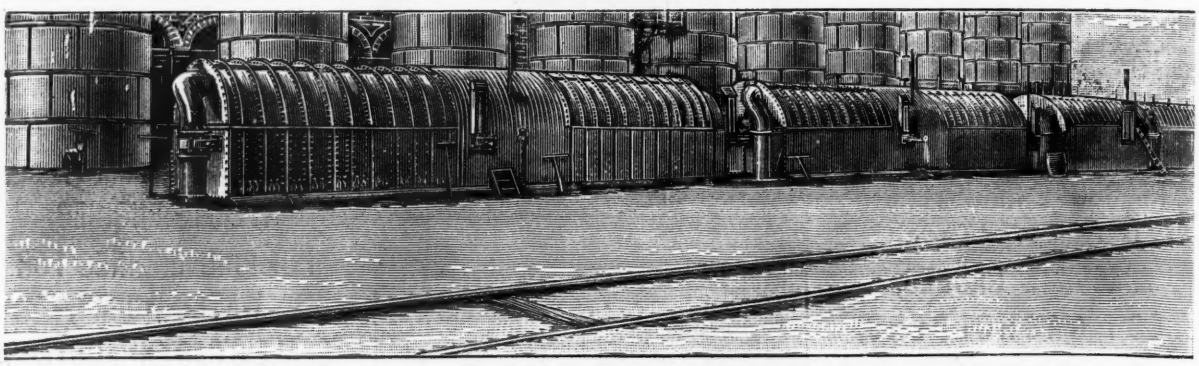

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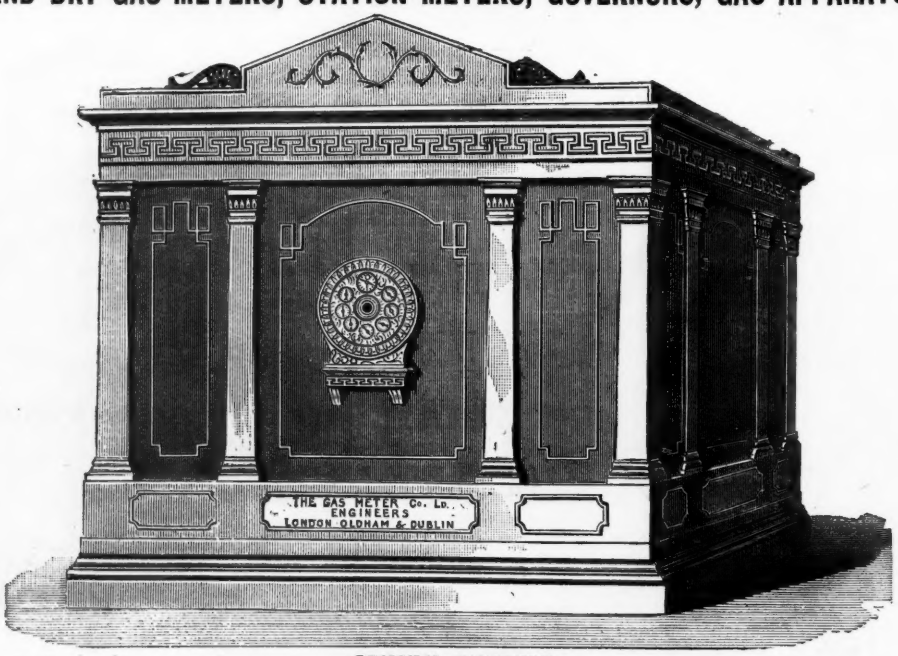

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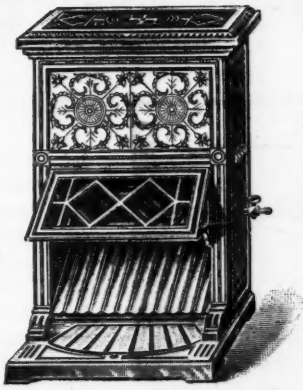

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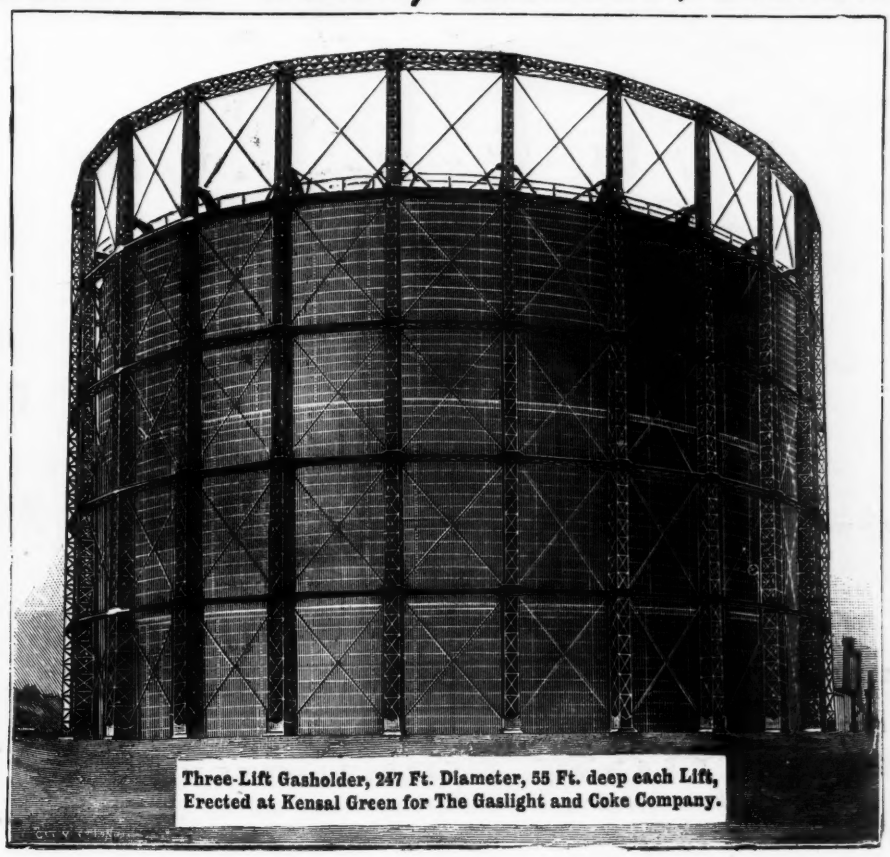

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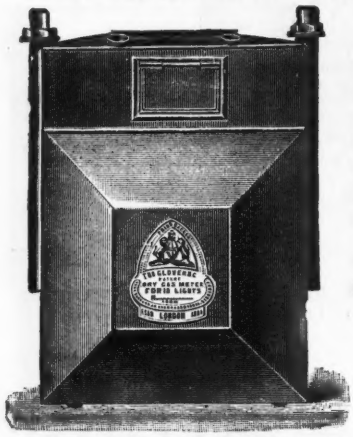

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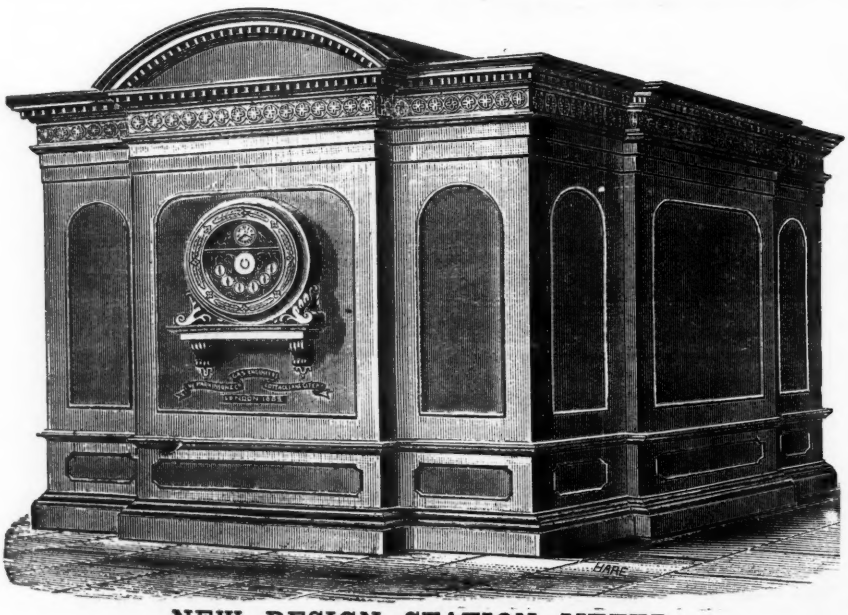

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 5, 1893.

What is the Meaning of the "Living Wage"?

THERE has been an immense amount of talk of late on the subject of the "living wage;" and, as generally happens in such cases, people have been talking about it until they have lost all sense of the meaning of their words. One set of chatterers have denounced the idea of the "living wage" as something wholly new and strange, and consequently objectionable; while others have taken the same description of it as constituting its best recommendation. The phrase came into currency during the coal strike in the Federation districts; and its primary purpose was to excuse the strike leaders from looking in the face the facts of the coal market. We are not going to enlarge upon the economical laws which govern the rate of wages in this or any other age; but it may be of some little assistance to our readers to point out that this notion of the "living wage" is not new, although its applicability to the case of the members of the Miners' Federation was questionable. The essential idea is clearly explained in a chapter in Mr. Walter Besant's novel, "The Children of Gibeon," entitled "The Law of Elevenpence-half-penny." This means no more than the lowest return in money for which a particular kind of work can be obtained. There is a point below which wages cannot be depressed, for the simple reason that nobody can be induced to work for less. There is no mystery or novelty about this. Just in the same way a commodity in a shop-window has its minimum price, beneath which it will not pay the dealer to sell it. The whole conduct of trade is devoted to ascertaining what merchantable things can be made and sold for. So long as the margin between these two rates is wide enough, on the right side, so long will the trade in the article, whatever it may be, live and flourish. The moment this margin disappears, trade languishes; and when it occurs on the wrong side, the article passes out of the market. The most cursory reflection will recall to the memory of any man of mature years the names of commodities that are no longer on sale as they were in the days of his youth. The time came when the trade in these things did not pay; and so they ceased to be grown, manufactured, mined, or imported, according to the circumstances. Yet in their day all these vanished commodities returned their living profit to some persons, and their living wage to others interested in the trade.

Well, now, where is the difference between these things and the case of coal? Unless he can supply at his living profit, at the market price, the colliery proprietor will not continue in the trade; and since wages enter into his reckoning of prime costs, the permissible amount of this charge must depend upon the state of the market. The crucial part consists in this—that, although the market price limits the amount which the colliery proprietor is commercially able to afford for wages, there is nothing to compel him to pay the utmost upon this account which he can actually afford. Consequently, the periodical adjustment of wages is left to be effected by the unsatisfactory method of bargaining. Essentially, the recent strike and lock-out of colliers was nothing more than what is seen every day in the streets, when a would-be purchaser, having ascertained the price put by a retailer on an article, walks off in a real or assumed huff, and bides his time. In ages which are fast becoming legendary, every commercial transaction was prefaced by this higgling—sometimes carried to the extreme length of fighting over the article, and often lasting for days and weeks. The slow growth of common sense, however, has already persuaded a large section of the community as to the advantages of fixed prices. We seldom now-a-days beat a tradesman down over his own counter; but we take note of his tender, and deal with the lowest offer, or go without the goods. There is no getting away from this rule of the market, save by Protection. If they were left alone, all producers, manufacturers, or workers would protect their own profits or wages at the expense of the rest. We in England are not prepared to tax ourselves generally in order to benefit anybody, be he agriculturist, colliery proprietor, or labourer. Our markets are open, and those who cannot make a living in one trade are at liberty to throw it up in favour of any occupation which offers better remuneration. Nobody seems to know what the average collier regards as his "living wage." He professes (or his mouthpieces declare for him) that he cannot live in 1893 upon the pay that served him in 1888. We do not claim to be able to say how this thing may be. But it is at least certain that no man is bound to get coal in England against his will; and if the recompense which the colliery proprietor is able to offer for this kind of work is insufficient to attract men to and keep them at it, the men must find other work to do, and we must get our coal from other sources of supply. This, in a nutshell, is the philosophy of the "living wage."

Sir George Elliot's Scheme.

NOTHING has been heard for some time of the scheme for a Coal Trust proposed by Sir George Elliot; and it is reasonable to assume that the colliery proprietors to whom

the project was first addressed have had their hands too full of more pressing concerns during the last month or two to permit them to undertake the consideration of a project of such magnitude. Within the past few days, however, it has been reported that, at a conference of coalowners held in Newcastle-on-Tyne, under the presidency of Sir George Elliot, the scheme was not only submitted for discussion, but was held to be a desirable and feasible way out of a state of things that has become intolerable. The meeting resulted in the formation of a small but influential Committee, charged to further inquire into details and report to another conference of north country coalowners, who will assemble again in Newcastle at no distant date. It was thought that the suggested plan might be tried in the first place by sections or districts, each comprising one of the great coal-producing areas of the kingdom. Colliery proprietors are not the men to waste time and thought upon an impracticable scheme of amalgamation; and the fact that they have already taken action in the way reported, must be interpreted as an intimation that there is no patent incompatibility between any fundamental point of the project in question and the actualities of the coal trade. The gas industry is fortunately in a position to regard with benevolent neutrality any scheme of the kind under consideration. Gas supply is a protected enterprise, inasmuch as all working expenses and prime costs are chargeable against revenue, and profits are automatically governed with reference to selling prices. There is no valid reason why the industry of coal production should not be similarly regulated, if a sound basis of arrangement could be arrived at. The principle of a sliding scale is quite competent to embrace the coal industry, if its operations are given the proper scope, and the datum is fairly fixed. It is essential, however, that the feature which renders the sliding scale of gas supply so peculiarly valuable — the inducement, that is, to sell the product at the lowest possible price—should be preserved in any Coal Trust that may eventually take shape as the result of Sir George Elliot's present initiative; and the chief fault we have to find in his suggestions is that they do not contain anything of the kind. It might be objected, perhaps, that to put pressure in this way upon colliery proprietors to cut prices would encourage them only to continue to treat wages as a squeezable charge on production. But experience shows that this is not the case in the gas industry; and we are persuaded that it would not be likely to happen in that of coal, if the masters were only assured of getting a fair price for their product at all times. It is the fluctuations of prices that hit the producers most sorely, and through them the men employed in production. If a workable Coal Trust could be formed, it would have one result of far-reaching importance to the domestic consumer—the whole of the middlemen would lose their power to charge fancy retail prices, and would become in time only agents. What this would mean does not require to be explained. At every turn of the market, the consumer is pinched by the coal merchant; and the mere fact that these dealers can afford to pay canvassers the traditional half-a-crown a ton commission on householders' orders, is sufficient proof of the enormous waste, in an economic sense, of the existing system of coal distribution throughout the country.

The Parliamentary Notices of Gas Bills.

THE parliamentary notices of Gas Bills and Provisional Orders which appear in another column give gratifying indications of a revival of business in this respect. There are seventeen Gas Bills, or Bills referring to gas supply, eight Board of Trade Orders, and one Local Government Board Order of the same description. Not one of these measures is of first-class magnitude, having regard to the principles involved, though several contemplate the raising and spending of considerable sums of money. Taken as a whole, they go to show that gas supply is extending and growing at the normal rate. The most conspicuous Bills covering what may be considered locally as controversial ground are those of the Preston and Plymouth Companies, both of which also demand the grant of electric lighting facilities to the undertakers. It might have been supposed that this kind of weakness would not have survived the persistent discouragement of Parliament; but apparently the echoes of past conflicts on the subject have not reached so far as Preston and Plymouth. There will be a fair amount of Scotch business next session; Edinburgh, Dundee, and Falkirk being desirous of further statutory powers in relation to gas supply, and the last-named town being in the throes of a Company dissolution and transfer movement. Torquay and Paignton—both growing towns—require parliamentary assistance in the regulation of their gas supply; and the same may be said of Carshalton, which town and Harrow are the only places near London included in the list of notices. All the Provisional Orders refer to small undertakings. It would not have been surprising if some more of the larger Gas Companies had followed the example of the Bristol and Crystal Palace District Companies, and gone to Parliament this year for cheaper capital, with unification of their old stocks. As it is, though next session will not be lacking in much interesting work, and there is some probability of a sharp fight or two, the legislative programme is not of a specially exciting character.

The Lords and the Employers' Liability Bill.

PUBLIC interest in the Employers' Liability Bill just now centres in the sayings and doings of the Lords, who read the measure a second time last Friday, and will commence considering it in Committee on Friday next. Greatly to the chagrin of the partisans of the New Trade Unionism, the associated representatives of the railway, gas, and chemical workers who desire the maintenance of established insurance funds, and object to the change of the law proposed by the Government, were busily engaged during the past week in laying their views before different influential peers; and it is generally believed an amendment permitting "contracting out," under certain conditions, will be inserted in the Bill during its progress through Committee. That duly safeguarded liberty in this respect should be unpalatable to the believers in Home Rule, Local Option, and the right of individuals to defy the vaccination laws, is one of the most remarkable political developments of the times. It is difficult to discover the principle of these workings of the administrative machine; and so we are perforce content to watch and wonder at them. With regard to the question of contracting out, it is desirable to point out that, although the issue has been raised on the case of the employees of the London and North-Western Railway, this has only been for the sake of convenience, or, as the French say, for "fixing "one's ideas" in reference to the general subject. Up to a point, it was convenient for the enlightenment of the ordinary Member of Parliament who is not an employer of labour on a large scale to put the case as represented by this particular railway fund. This was the more instructive, from the political standpoint, inasmuch as the last Hereford election notoriously turned on this case. It is time, however, to remember that the question at issue is not that of the arrangements of one or even of two railway companies, but of the liberty of all employers and workpeople in any industry to agree together for the purpose of mutual protection. Regarding the matter from this point of view, it might be argued that workmen should be left to decide what is best for themselves in the future as well as with respect to established arrangements; and the Earl of Dudley is going to move an amendment to this effect. Taking the case as it stands, it is difficult to reconcile the fact that 100,000 workmen are entrusted with the privilege of balloting for Members of Parliament, and are thus rendered competent to decide the fate of Ministries and nations, with the supposition that they are not competent to say how the risks of their ordinary employment shall be provided against. The debate on the second reading of the Bill in the House of Lords is well worth perusal. The only speakers on the Government side were the Marquis of Ripon and the Lord Chancellor; and the speech of the latter was one of the best that has been addressed to any audience on this thorny and obscure subject. We confess that we should take a keener interest in these debates, but for the feeling that the condition of workpeople in good employ will not be greatly affected by the fate of the Bill.

The Tatham Project and the Public.

WE remarked last week that the Tatham oxy-oil project would have to be dealt with thenceforward as a question of business; and apparently the persons interested in pushing the Tatham process before the British public cannot wait any longer. Clipped and mutilated reports of the proceedings

at the Southern District Association meeting on the 23rd ult. have already appeared in some insignificant "financial" journals. The Chairman of the Huddersfield Corporation Gas Committee has obligingly permitted himself to be "interviewed" on the subject of the Huddersfield working, by a newspaper reporter whose public-spirited employers naturally burnt to learn what is newest and best in gas-making methods, and knew (by intuition merely) just where to seek for it. In all probability the old game will now be played to its conclusion in the issue of a flaming prospectus, studded with the impressive opinions of the various journals capable of being influenced in favour of the scheme by means which need not be explained. If there had been anything in the process in question, these tactics would not have been required. We have been content hitherto to point out that the claims to superiority over all the other methods of gas enrichment advanced on behalf of the oxy-oil gas process have not been proved, and have thought no worse of some of its most enthusiastic partisans than that they were deceiving themselves. Now we shall incline to think that these claims never can be proved, and that those who press them in the present state of knowledge are willing to deceive others. Unless certain individuals who might be named are very careful, more than the money of a few speculators will be lost over this affair. Not a single point in the Tatham project has been established—whether as to its superiority over other processes, its actual cost, or the validity of one of the patents upon which any property in it must depend. If the promoters had waited until they had silenced criticism upon these open questions, before letting the public into their proceedings, they would at least have been able to hold out clean hands for the money they might have hoped to obtain. They have chosen to act otherwise; and they must accept the consequences.

The Nationalization of Mines.

A curious Bill has been introduced into the House of Commons, bearing the short title "Mines Nationalization," and endorsed by Mr. Keir Hardie, Dr. Clark, Mr. John Burns, and four other honourable members of the same stamp. It has been printed, and is on sale at the very reasonable price of one halfpenny, which, for such a curiosity in projects of legislation, is decidedly cheap. We give an epitome of the measure elsewhere. It starts in due form with a preamble of four propositions, prefaced by the indispensable "whereas." The first of these declares that "coal, having become an essential factor "in the manufacturing industries and transport service "of the nation, any interference with a regular and con-"tinuous supply is fraught with gravest dangers to our "commercial supremacy." The collective wisdom of the nation, in Parliament assembled, is then thoughtfully reminded that the supply of coal is limited, and when exhausted can never be replaced. This leads up to the assertion that the present system of working mines in private hands tends to great waste, and also to strikes and lock-outs; "thereby imposing great hardship on the "mining community and trades dependent on a mineral "supply for their continuance." Then comes the declaration that "the nationalization of the minerals and the "mines would secure the economical working of the "same, the just treatment and consequent contentment "of the mining population, and a continuous and cheap "supply of coals and other minerals." There is no difficulty in the way of showing how this object is to be attained. The whole thing is settled in five short clauses, concise enough to make any and every drafter of the "Omnibus" Bill of some small municipal corporation thoroughly ashamed of himself. It gives such a hand more labour in verbiage to regulate a slaughter-house than it does Mr. Keir Hardie and his colleagues on this Bill to murder the coal trade. They simply propose that on and after a certain epoch (which has been considerately deferred to Jan. 1, 1895) all mines and minerals within the United Kingdom of Great Britain and Ireland "shall "be transferred, in fee simple, to the Crown, and shall "therefrom become the property of the nation." In preparation for this event, all owners, in whole or in part, of these mines or minerals are to make a declaration of the nature and extent of their pecuniary interest therein by May 1 next. The present value of the mines and minerals is to be assessed without reference to the amount of capital invested or to the prospect of profits. A Government Department of Mines is to be created, under a President, whose name is to be—no, this is a detail which would be easily supplied in Committee. Suffice it to say that the eight-hour day, the "living wage," full compensation to workmen while incapacitated through "sickness," with old-age pensions, and all the other points of the New Trade Unionist Charter, are fully granted in the draft of this amazing Bill, which is a remarkable production to be credited to Members of Parliament of the class which loves to be regarded as "practical," or at least sane.

WATER AND SANITARY AFFAIRS.

It is somewhat out of the ordinary course of things to find the London County Council discarding a recommendation emanating from their exceedingly zealous Water Committee. For once the Committee have really gone too far, even in the opinion of the governing body. Last Tuesday, Mr. Bassett Hopkins brought up a report from the Committee, of which he is Chairman, proposing that fourteen samples of the London Water Supply, and two of the raw river water, should be taken every week; the Council's Chemist to submit the results of analyses of such samples to the Committee. It was estimated that the expense would not exceed 10s. per sample. This, we should say, would be cheap, but the total would be considerable—running up to at least £400 per annum. As much as £800 was alleged by one of the speakers in the debate. Any adequate reason for such an outlay it is impossible to find, for surely never was water so mercilessly analyzed as that which flows through the mains of the London Companies. The Royal Commission received a mass of evidence on the subject, including the testimony of the County Council's Chemist; and the result is seen in the report, where the Commissioners declare themselves "strongly of opinion that the "water, as supplied to the consumer in London, is of "a very high standard of excellence and of purity." This would seem sufficient to satisfy anybody. If it is thought desirable that there should be a continued guarantee as to the quality of the water, there is the monthly report furnished to the Registrar-General by Dr. Frankland, and the more extended annual report from the same scientific authority. The Water Committee desire "an independent examination." Do they mean by this that they distrust Dr. Frankland—himself a very purist in water questions? Every month there is also the elaborate (and we may say exhaustive) report from Mr. Crookes and Dr. Odling, containing analyses enough to gratify the most exacting. Admitting that these two highly qualified Chemists are engaged by the Water Companies, no one can imagine that men of such standing would belie their own reputations by furnishing fallacious returns. Are they supposed to play tricks with the carbon and nitrogen, and to falsify the decimals? In addition to the chemical evidence, there has been for some time past the bacterioscopic, as furnished by Dr. Frankland, at the request of the associated Water Companies, in each of his monthly reports. This information is especially valuable—perhaps more so than all the rest; yet the County Council Committee seem to leave it out of their scheme. After some discussion, the Council saw fit to send the recommendation back to the Committee; the wasteful and extravagant nature of the proposal being too obvious to permit of its adoption. In connection with this subject, we may mention that General Scott's report for October, issued on Saturday, shows that more than 18 per cent. of the London Water Supply in that month was derived from springs and wells. Also that 99 per cent. of the houses in the East London district were supplied with water on the constant system.

Particulars as to the Bills which are to be brought into Parliament next year relative to water supply will be found in another part of our columns. In previous numbers of the Journal, we have discussed the leading features of the Bills of which notice has been given by the West Middlesex, the Southwark and Vauxhall, and the East London Water Companies, as also the Water Bill of the London County Council, and the Bill for reconstituting the Thames Conservancy Board. In connection with the Metropolis, there remains for consideration a Bill of which notice has been given by the Colne Valley and Central Middlesex Water Companies. The Central Middlesex

Company is formed under the Limited Liability Act, and is styled in the notice "the Limited Company." The Bill is to provide for the purchase by the Colne Company of certain portions of the water-works appertaining to the other body, supplying water in the parishes of Harrow-on-the-Hill and Northolt. Such mains and pipes as are requisite for the supply of the remaining portions of their district are to be reserved to the Limited Company. That part of the parish of Harrow-on-the Hill within which the supply of water is to be transferred to the Colne Company lies northward of the River Brent, and on the south-west side of the London and North-Western Railway. In the parish of Northolt, the part to be transferred lies immediately north of Wood End. That which may possibly prove to be a rather important clause in the Bill is to authorize the Limited Company to sell and transfer all or any part of their remaining undertaking to any one or more of certain Companies—namely, the Colne Company, the Grand Junction Water Company, and the Rickmansworth and Uxbridge Valley Water Company. In connection with this Bill, it seems appropriate to mention one for the cleansing and purification of the Brent River. According to this project, a Board of Commissioners is to be constituted, for the purpose of cleaning and improving the River Brent and certain tributaries thereof. The Commissioners are to have power to enter into agreement with various parties, including the Thames Conservancy and the Grand Junction and West Middlesex Water Companies, in order to carry out and maintain any works to be constructed for the purposes contemplated by the Bill. It is specified that the expenses are to be defrayed by means of rates levied on the districts represented by the Commissioners. It will be interesting to know more distinctly what is intended by the Bill; but at present it is difficult to see what the foregoing Water Companies have to do with the purification of a river which finds its outlet into the Thames many miles below their intakes.

The Water Bills of which notice has been given from parts of the United Kingdom out of London do not present any project of much magnitude. The Barnsley Corporation want to extend their limits of supply to a number of neighbouring townships, and propose to purchase by agreement the water-works of the Penistone Local Board. The Cardiff Corporation seek power to enlarge a reservoir, and to carry out other works, including a new pipe-line. The Newcastle and Gateshead Water Company desire to abandon the construction of certain works, including a reservoir, and to construct other works, comprising a reservoir in Rochester and Troughend. The Consett Water-Works Company propose the construction of three reservoirs and other new works, in connection with which enlarged powers and extended limits are wanted. The rights of the Newcastle and Gateshead Water Company to supply certain townships are to be extinguished in favour of the Consett Company, who, on the other hand, will relinquish some of their own rights. The Corporation of Gloucester intend to apply for power to construct new water-works, including a well and pumping-station, a reservoir, and two tunnels. The Local Boards of Old and New Swindon will promote a Bill to confirm an agreement which they have entered into for the purchase of the property of the Swindon Water-Works Company, Limited. The two Boards are to be incorporated, and a Committee is to carry on the undertaking. There are to be new works, and an enlarged area of supply. The South Hants Water Company seek an extension of limits so as to include several parishes; and they ask for authority to purchase any water-works existing in those places. The Southend Water Company contemplate new-works, including four pumping-stations, with corresponding pipe-lines. As a general rule, these projects involve the raising of additional capital. There is, however, no proposal for the appropriation of any remote and extensive source of supply. Mountain lakes and head waters are threatened with no invasion which may interfere with the designs of the London County Council. All that can be observed is the necessary extension of the water supply, to meet the wants of the ever-increasing urban population. Municipal Corporations and Statutory Companies alike feel this pressure, and have to meet it.

Mr. H. R. Maynard, of Lydd, Kent, has been appointed Secretary to the Lydd Gas Company.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1051.)

THE past week has witnessed a remarkable change come over the Stock Exchange. It opened quietly enough, and was, if anything, inclined to be dull. The settlement proceeded smoothly; but fresh business was very scarce. On Wednesday and Thursday, however, there was almost an outbreak of activity; and a degree of cheerfulness prevailed that has not been known for many months. People seemed to think that the long-delayed revival had really come at last. At the same time, however, speculation was kept within very cautious bounds, and by far the greater part of the business transacted was the investment of accumulations for which no other opening could be found. We referred last week to the existing excess of demand for the highest class securities over the supply, and to the almost necessarily resulting resort to the next best. This has now come into operation; and all the second-class investments have experienced a liberal rise in value. At the same time, the brightness has extended sympathetically, though in a less degree, to other markets; and the result is a general improvement all round. It is sincerely to be hoped that this may prove to be the initiation of a permanent amelioration, and that the recent terrible depression is fairly gone; but the probability of occasional reactions occurring must be borne in mind. The Money Market has been fairly firm throughout the week, though the tendency was rather easier after the conclusion of the settlement. Transactions in the Gas Market have been decidedly fewer than in the preceding week; but it exhibited remarkable strength. The ordinary stocks in general were well supported, and scored material advances; but the chief feature was the extraordinary and sudden rise of Gaslight preference issues in obedience to the demand for good investment stocks already referred to. These have advanced from 5 to 10 per cent. on the par value; and the highest priced (which, singularly enough, is the most deferred in the order of preference) returns only a trifle over 3½ per cent. Gaslight "A" steadily improved from 230 to 233, the last mark. Very little was done in South Metropolitans; but the "A" advanced 2. Commercials were completely stagnant. The Suburban and Provincial Companies were extremely quiet; and the only change was a rise of 1 in Brighton and Hove. The Continentals were fairly active, especially Imperial; and all exhibited a favourable tendency—Imperial and Union preference gaining in price. None of the rest were noticeable, except that Chicago second mortgage bonds were 1 higher *ex div.*; while Buenos Ayres shares fractionally receded. Business in the Water Companies has been well up to the average mark. Movements were slight and irregular; Kent and New River improving, while Grand Junction receded.

The daily operations were: The growing strength of the Gas Market was manifest from the opening on Monday, though business was not particularly active. Gaslight "C," "D," and "E" advanced 2; and Imperial Continental, 1. Grand Junction Water fell 1½. Tuesday was still quieter; and the only move was a rise of 2 in Continental Union preference. More activity was apparent on Wednesday, and prices were good all round, though Buenos Ayres fell ½. In Water, New River rose 2; and Kent, 1. On Thursday came the chief advance. Gaslight "A" rose 1; "C," "D," and "E," 8; "F," 7½; "J," 7; "K," 5; and 6 per cent. debenture, 2. Imperial Continental also advanced 1. Friday was fairly brisk, and very firm. South Metropolitan "A" improved 2; and Brighton and Hove, 1. Excellent prices continued to be had on Saturday; but quotations made no further move.

ELECTRIC LIGHTING MEMORANDA.

The Depreciation of Electric Mains—The Dangers of Underground Electrical Distribution.

IT is a commonplace of popular writers and speakers upon industrial applications of electricity, to observe that all these industries, including that of electric lighting, are still "in their infancy." This incontestable remark is usually regarded as the starting-point for a number of more or less fascinating and picturesque prophecies of what electricity is to do for mankind when it shall have grown up and outlived the little shortcomings of its youth. There is another side to these fancy embroideries, which is commonly ignored; but it is a question whether it is not even better worthy of the attention of electricians properly solicitous for the future of their cause, than the aspect which they are so careful to turn towards the public. We are in the habit, in this column, of contemplating electric lighting enterprise in the cold light of experience of a cognate industry that has "arrived," as the French say; and when we survey the contemporary statements that appear from time to time, to show the extent to which the newer industry is being developed, we cannot forget one or two considerations that usually remain to be supplied in these accounts. The first of these refers to the open capital account of central station electric lighting ventures, as to which there is nothing further to be said just now. The second refers to the vexed question of repairs, maintenance, and depreciation, which gains in importance every day, and is accentuated by innumerable little

incidents that continually crop up in connection with the working of generating stations and the distribution of the output. Take, for example, the actual state of the case as between the low-pressure direct and the high-pressure alternating systems of supply. In the former, a large proportion of capital is represented by the heavy copper mains, which, once laid, are likely to prove at least as durable as cast-iron gas-mains, and therefore lie outside the domain of depreciation. It is admitted, however, that this system is of limited application, and that the immediate future of central station electric lighting is bound up with the high-pressure alternating system, which involves insulated mains. How long are these likely to last in any particular example? It is impossible to say; but in the answer to this question lies something that may prove an unpleasant surprise to investors long before the fancy pictures of the popular lecturers take shape and being. Already the electrical journals are sounding a note of alarm on this subject; and it has been roundly stated that, while the permanence and sufficiency of the distributing plant is of capital importance in regard to the commercial prospects of all central station undertakings, nothing like proper attention has been devoted to this part of the plant. Dynamos and everything else have been discussed exhaustively, until it is hardly possible for electrical engineers to make a serious mistake in their choice of patterns; and if they do, mistakes in the above-ground machinery are easily remedied. It is very different with the below-ground work; and when one recalls the temporary, flimsy appearance of a great deal of the electrical distributing plant that goes under the streets, it is impossible to resist the suspicion that these things must give trouble at no distant date.

The duty of gas engineers in regard to the matters dealt with in the foregoing paragraph is clear. Whatever may come of the Board of Trade regulations respecting the means to be taken for the prevention of induction effects, and the diminution of the risk of electrolytic mischief, those who are responsible for the safe distribution of gas must see to it that their work is not injuriously affected by the operations and mishaps of electricians. There have been street explosions, roundly speaking, wherever electric lighting mains have been put underground. It seems to matter little in this respect whether these mains are bare or insulated. In some systems of electrical distribution, there is a combination of the two. In every case, the natural impulse of the public is to blame gas, with the explosive capabilities of which they are more or less acquainted, while they do not as yet associate the idea of explosion with electric lighting arrangements. The electricians, moreover, who have always made such capital out of the asserted safety of their work in regard to fire, will naturally be careful not to disturb this prepossession of the public mind. We owe it to our esteemed contemporary the *Electrical Review*, which ever does its best to shake electricians out of the Fools' Paradises into which some among them are so prone to lull themselves and the public, to acknowledge the prudent outspokenness of its attitude on this serious question. There have been violent street explosions in Glasgow and Manchester, to say nothing of the City of London; and our contemporary is not at all disposed to accept the comfortable theory that these effects are chargeable to gas leakage. "It is possible to have an explosion brought about by coal gas leaking into the conduits, but not very probable," says our contemporary. "At any rate, if gas can get into the conduit, water can also get in; and even if gas gets in, it should not be possible to explode it, if the electric mains are properly laid. It requires an electric spark or a red-hot conductor to fire coal gas; and any conduits in which an electric spark, a red-hot conductor, or an arc is possible, must stand condemned." This is plain speaking; but the plainest speaking is necessary to make it clear, before a great catastrophe occurs, that the possibility of it exists and is also recognized. Street-box explosions may or may not occur at unfortunate junctures, and produce disastrous effects; but if they do, it is as well to know how they are to be explained, if they cannot be prevented. The latter is the duty of electricians; and it is to be hoped they will prove equal to it. The *Electrical Review* refers, in discussing this subject, to the remarkable experiment shown at the Chicago Exhibition, when a piece of iron was heated to the point of fusion in a pail of water. The experiment formed the subject of a "Note" in our issue for Sept. 5 (see *ante*, p. 445). It is remarked that "it is more than probable" that similar effects are produced in street conduits when water gets into them and makes contact with the producers. This suggestion goes far to explain how otherwise mysterious explosions may be produced. The reflection thus suggested is the reverse of comforting; but nothing is to be gained by shutting one's eyes to facts. It is certain that the possibility of such a phenomenon as that alluded to was not suspected by the best-instructed electricians before the summer of this year; and when one has such an incalculable thing as electricity to deal with, it is impossible to say what may happen.

The William Livesey Testimonial Fund.—Our attention has been called to two omissions which occurred in the list of subscriptions to this fund which appeared in the JOURNAL for the 1st of August last, and we are asked to put the matter right. Among the first contributors to the fund there should have been included the Ipswich Gas Company for £5 5s., and the Sutton Gas Company for £10 10s.

THE "LANCET" REPORT ON GAS-STOVES.

REFERENCE was made in last week's JOURNAL to the reports of the *Lancet* Analytical Sanitary Commission on Smoke Prevention, which have appeared at intervals in the pages of this leading organ of the medical profession, and have terminated in an emphatic recommendation of gas-stoves both for cooking and heating. We now propose to give a fuller account of the working of this Analytical Commission, and to recount how the result already signalized was arrived at. It appears that the attention of the *Lancet* was directed to this important subject in the winter of 1890-91, in connection with "the increasing prevalence of fogs, the unlimited growth of this immense Metropolis, the rise in the price of coals, and the exceptional severity of the winter." It was remarked that, "with the prevalence of fogs, the death-rate rises, and, of course, those who are suffering from diseases of the respiratory organs find their complaints greatly—sometimes fatally—aggravated when they have to breathe the soot and the sulphurous gases which, when mixed with aqueous vapour, constitute the special characteristics of a London fog." It was also recognized that these unpleasant concomitants of fog are entirely due to the hundreds of thousands of chimneys daily pouring out black smoke, the number of which is increasing to an appalling extent. Black smoke means nothing more nor less than imperfectly-consumed fuel; and if this imperfection of method in burning coal were removed, the double advantage of obviating smoke and of preventing a great and disastrous waste of fuel would be gained. For years, however, such a consummation has been sought in vain; but the *Lancet* set off, hopefully at first, in search of the perfect fire-grate, with a view to recommending it, when found, to the patronage of the medical profession. This was three years ago.

The inquiry made something very like a false start. The first thing our contemporary discovered appears to have been that a Russian Civil Engineer—M. de Clausen—had constructed a stove possessing vast but unappreciated merits, which seemed likely to render great services to the cause of health and social economy. Accordingly, the first report of the Analytical Commission had a good deal to say about this stove of M. de Clausen. This was labour thrown away; for if the people of England cared for stoves as a general thing, there would be no difficulty in clearing the sky of smoke. As it is, the question of the comparative excellence of one particular pattern of close stove among many is completely beside the mark, seeing that the great British public requires something more to wean it from the open, smoky fireplace.

After thinking the subject over for a year, and finding no better means of disestablishing the open fire for living-rooms, the *Lancet* Commissioner issued a second report, in March, 1892, which abandoned this part of the question, and was wholly taken up with the description of a particular pattern of close kitchen range. This method of treatment was, it must be admitted, unworthy of the design of our contemporary. There is no difficulty whatever in attaining either smokelessness or a high degree of fuel economy in close stoves and kitcheners; and the worst of these appliances will burn coke, properly broken for the purpose, which is both cheaper and cleaner than coal. To set out with a "Commission" to grapple with the problem of rendering the atmosphere of London clean, and stop with recommending a kind of heating-stove and a proprietary make of kitchen-range, is simply to play with the difficulty. If these first two reports had been the total outcome of our contemporary's analytical labours, they would never have been mentioned here. Fortunately for the credit of the *Lancet* Commissioner, his third and last report, which is contained in the issue of this periodical for the 25th ult., has a greatly extended purview, and is framed in a fashion more appropriate to the immensity of the subject. This third report, it is only fair to say, has an air of comprehensiveness which is fairly justified by the scope of the detailed investigations described.

The inquirer appears to have been concerned at first to satisfy himself as to whether, supposing the use of coal gas as fuel to become general in London, the existing arrangements for producing the commodity might be depended upon to meet and cope with the enormously increased consumption which would thereby ensue. It is a rather strange point for an outsider to trouble himself over; but since the question took the *Lancet* Commissioner to the offices of The Gaslight and Coke Company in search of reliable information, it was not raised in vain. For not only were the Company's officers able to satisfy the inquirer on the immediate point, but it is doubtless also due to their further communications on the general subject that he was prevented from repeating the usual small-talk about the possibility of a cheapened fuel-gas supply. Having become duly impressed with the capacity of the works of The Gaslight and Coke Company to supply all possible demands of the present and the future, the investigator plunged forthwith into the study of gas-fires and warming-stoves.

Here it is advisable to remark that, while evidently well qualified for his task in many respects, this inquirer appears to have been unprepared with any guiding principle or general system for his investigations. He has no idea of laying out the field of his inquiry so as to go over it thoroughly, and not overlook anything that might be found there. This fault somewhat vitiates his work, from first to last. He started

to study the means of preventing fogs; and he immediately got stuck to the first decently-designed stove that came under his notice. It was the same with kitcheners—he could only see one pattern in the market. So with gas-stoves—his attention is caught and held fast by the class of appliance "in the structure of which the atmospheric or Bunsen burner is an essential feature." This limitation of view is also attended with a lamentable confusion of ideas; for we find the writer stating that "in some forms [of gas-fires] there is no fuel; the gas is simply burnt, and the heat of combustion carried away by the products, and partly by heat currents of ascending air, and is thus directly utilized. But in by far the majority of stoves a form of indestructible fuel, as clay, asbestos, or iron, is maintained at a cheerful glow by the heat of the almost invisible Bunsen flame." This misuse of the term "fuel" to mean something which is no more combustible than the casing of a close fire stove or the hot-plate of a kitchener, is a deplorable blunder, and tends to give circulation to the vulgar error that the fire-clay, asbestos, or iron of gas-fires has an active share in the development of heat. There is quite enough of misunderstanding respecting the economical qualifications of atmospheric gas-flames, without increasing it in this way. The writer really ought to have known better. He makes the statement that "ordinary luminous flames could not be used for heating fuel (?) as the introduction of a cold body into a luminous flame results in a considerable deposition of soot;" and this would have been a distinctly good place for making it clear that in any gas-fire or stove it is the gas alone which supplies the heat, so that the question whether or not the gas-flame shall be luminous depends entirely upon the purpose for which it is intended to be used. It does not by any means follow that the luminous flame is not the best for heating because it is also good for lighting; and whoever attempts to write critically upon gas-stoves without knowing all that has been written and done for the elucidation of this point by truly scientific workers is to this extent unfitted for his task.

For the above reason, the work of the *Lancet* Commissioner upon gas-stoves is imperfect; but it does not follow that, within the limitations imposed by his lack of comprehensive knowledge of the subject, his inquiry was unfruitful. On the contrary, the investigation was very useful and instructive, and well worth the doing. It was carried out in the following manner: A number of gas-fires and heating-stoves of different patterns were put in action in a room, one after another, under as nearly as possible uniform conditions; and the results as to warming effect, consumption of gas, composition of flue gases, &c., were tabulated, and compared with the duty of an ordinary fire-grate burning coal. The experimental room had a content of 1080 cubic feet; and therefore it cannot be called a spacious apartment. All the stoves tested stood out on the hearthstone in front of the fireplace; and, with the solitary example of one "condensing" stove—in which, however, the flame was atmospheric—all were variations on the plan of atmospheric flames playing upon clay, iron, or asbestos, with or without structural arrangements for facilitating the circulation of warmed air.

The first thing that strikes an observer of the results of these tests is the large consumption of gas at the maximum available pressure, which ranged from 14-10ths to 19-10ths at the burner. This was anything from 40 to 60 cubic feet of gas per hour—raising the temperature of the room 9° or 10° in this time. None of these atmospheric stoves would burn at a lower pressure than 4-10ths, at which their gas consumption and heating effect would alike be about one-half of the maximum. The condensing stove, burning 16 cubic feet of gas per hour, was the most efficient of the lot; but, of course, all the gaseous products of combustion were in this case turned into the air of the room. It is remarked that the condensed fluid from this stove, after four hours' burning, measured 7½ ozs., and contained 0·00425 per cent. of NH_3, and 0·17 per cent. of SO_3. The gas-stoves came out poorly compared with the coal fire, which raised the temperature of the room 5° for a consumption of 2¾ lbs. of coal per hour, which at 25s. per ton cost only 0·3d. With the gas-stoves the same effect was produced, speaking roughly, for a consumption of about 20 cubic feet of gas per hour, costing about 0·7d. Upon this head, we do not cherish any delusions; and consequently the report does not shock us. We should be loth to admit that the gas-stoves tested thus were the best of their kind, although doubtless they were fair average specimens of the stove that sells most freely. Moreover, although gas burnt in a heating-stove is dearer than coal, fuel for fuel, mere fuel-value is not everything; and when all the pertinent considerations are taken into account, even the gas-stoves involved in this comparison are not without justification for their existence as articles of commerce.

The report is nothing if not analytical; and accordingly it contains a paragraph discussing, in the light of analysis, the character and composition of coal gas, and of the coal with which it has to compete as a fuel. It is thus shown that the gas from a ton of coal represents approximately one-fifth of the heat of the coal; "so that, if the ton of coal be worth 25s., the gas, as regards the heat-value, will be worth 5s., or 6d. per 1000 cubic feet." This is all very well as a theoretical statement; but the report admits that the calorific value of a fuel is not that which it can be shown to contain, but that which can be utilized. Taking this consideration into account, the gas shows a better duty than the coal. Even so, however, it is impossible to get away from the fact that, as compared with coal, the cost of a gas-fire is dearer in the ratio of 7 : 3. Any gas manager who should ignore this truth, and foist gas-fires upon his customers upon the supposition that they are as cheap as they are convenient, would not deserve well of his employers. Users of these appliances need to be cautioned with regard to their capacity for "making the wheels go round" in the meter, especially if the pressure is such as to give the best heating results.

On the whole, subject to the shortcoming already mentioned, the *Lancet* Commissioner has done his work well, and has rendered great service to the community and to the gas industry. His commendation of gas cooking is more thorough-going even than his verdict in favour of gas heating-stoves; and it should exercise the happiest influence upon the "faculty," whose good word stands for so much in these matters.

NOTES.

A Comparison of Hoisting Systems.

An instructive paper on the relative merits of different methods of working hoisting machinery was prepared by Mr. George A. Goodwin for the International Engineering Congress held in connection with the Chicago Exhibition; and it is published in full in the September volume of Transactions of the American Society of Civil Engineers. It is worthy of perusal by all users of hoisting machinery. The author concludes that, all things being equal, the first cost of a steam hoisting plant is less than for hydraulic or electric plants. In the case of cranes only, as they supply their own motive power, they cannot be affected by the failure of a main or the machinery at the power station. The plant can also be added to gradually at a less initial cost than with hydraulic or electric plants, where the power station has to be sufficiently large for the maximum duty likely to be required from it. On the other hand, steam hoisting is slow in action as compared with hydraulic or electric power; working only at about one-half the speed. Steam-cranes are costly to work, need careful driving, are noisy, and make a great rattle, involving much wear and tear. Moreover, there are risks of explosion and fire. The hydraulic power system has the advantages of cost of working reduced to the minimum, the quickest action, noiselessness, and cleanliness; and the high-pressure water is capable of being made available for the extinction of fires by means of injector hydrants. The chief disadvantages are high initial cost, and the consideration that, in the case of a breakdown at the power-generating station, or failure of the mains, all the plant would be stopped. Though the author mentions this, he does not consider it as likely to occur. Electric hoisting plant is fairly on all-fours with hydraulic plant; but it needs more careful working, and the up-keep is greater. On the whole the author prefers the hydraulic system.

The Manufacture of Carbons.

Mr. Clarence M. Barber has described the manufacture of carbons for electrical purposes. He states that, in electrical engineering the term "carbon" is used to designate an artificial solid which, through mechanical or chemical means, is derived from some of the natural forms of carbon. The materials usually employed are coke and pitch. Petroleum coke is largely used, although other varieties are often sufficiently pure for the purpose. It is ground to powder; and the volatile components are driven off by heating in retorts. Melted coal-tar pitch is then thoroughly mixed with the coke powder, and for some kinds of carbon lampblack is also added. The mixture is cooled, again ground to powder, and is then ready to be moulded, which is done at a sufficient heat to melt the fusible ingredients, and under a pressure of 400 tons. The moulded carbons are then fettled, sorted, and baked at a high temperature for a period of 100 hours. Some carbons are forced instead of moulded. One of the most notable points in regard to the burning of the carbon arc is that the temperature in the positive carbon rises much higher than in the negative one. Electric light carbons are coated to increase their durability, and cored to centralize the light and prevent hissing.

Stokes on the Luminiferous Ether.

Sir G. C. Stokes has recently published some interesting remarks upon a subject about which, he says, the study of light has caused him to think a good deal—namely, the nature and properties of the so-called luminiferous ether. It appeared from his discourse that Sir G. C. Stokes is one of those philosophers who regard the luminiferous ether as a conception of the scientific mind put forward as supplying the obvious need of something for light and gravity to act through, or by; thereby avoiding the alternative of supposing these phenomena to be the results of action at a distance. Newton himself scouted the idea of action at a distance as too absurd for any "man who has in philosophical matters a competent faculty of thinking" to entertain. He accepted the existence of an "agent" between bodies affected by gravity; but what this necessary agent might be he was content to leave to the consideration of others. Now, as Sir G. C. Stokes points out, modern science has shifted into the background the difficulty of defining the nature of this unknown agency, by calling it the

"ether," which term is in this connection no more than the mathematician's eternal x written in five letters. All that is certainly known about it is negative; while of many aspects from which the conception can be regarded it is impossible to say anything either positive or negative. Granting the physicist his ether, is this the same thing that propagates light and gravity? Sir G. C. Stokes confesses that "we do not know." We cannot conceive of space as other than infinite—is the ether likewise infinite? Again we do not know. Does the ether gravitate towards what we call ponderable matter? This is another question to which no positive scientific answer can be given; and the same remark applies to the question as to whether the ether consists of ultimate molecules, such as those of which there is strong reason for believing that ponderable matter consists. The undulatory theory of light was greatly promoted in the first instance by the known phenomena of sound; but the latter failed to show a counterpart to the phenomena of polarization and double refraction. These phenomena are only intelligible according to the theory of undulations by supposing the vibrations of the ether differ altogether in character from the vibrations of the air which belong to sound. Hence the ether is not at all like air, and almost the only other thing known about it is that it has not been proved to possess any viscosity, and that the extremely tenuous matter of which the tails of comets is composed does not suffer any noticeable resistance in passing through the space which it is presumed to fill.

A New Thermostat.

An improved form of thermostat has recently been designed by Mr. Walter Phillips. It is described as an improvement upon the instrument of Kahlbaum, and which was itself a modification of the original Page temperature regulator still to be purchased at depositories of chemical apparatus. The instrument is intended for use in maintaining an almost unvarying temperature where the normal heat is so high as to render the constant application of heat necessary. It is arranged to operate upon a supply of gas to the heating burner or furnace, and consists essentially of a sensitive bulb of glass containing methylated ether in communication with a mercury seal for the gas-supply pipe. There is always a connection left free for the passage of gas to a pilot light, which ignites the additional flow of gas delivered by the falling mercury when the decrease of temperature in the locality to be heated sets the apparatus in action. The instrument is described as being so sensitive in practice that the temperature record for a hothouse has shown a straight line as the minimum for a whole month. The temperature of sick-rooms has been equally well governed by the same means; and the apparatus has lately been applied to hatch germs in a bacteriological laboratory, where a constant temperature of 98° Fahr. was required.

The Evidence Given before the Royal Commission on Water Supply.—A copy of the minutes of evidence taken before the Royal Commission on the Metropolitan Water Supply, with appendices, index, and maps, has lately been presented to each House of Parliament.

Patent Law Reform.—In response to a general expression of opinion that the patent laws of this country are, in many respects, susceptible of great improvement, the Society of Chemical Industry have appointed a Committee to consider the whole question. They propose to prepare for presentation to the Government a memorial praying for the nomination of a Royal Commission on the subject; and they intend to seek the co-operation of other public bodies in the work.

Death of the Mayor of Southport.—The death took place last Thursday night, as the result of an attack of influenza, of Mr. Henry Hodge, Mayor of Southport. Mr. Hodge, who was born in 1835, was the son of a farmer. At the age of about eighteen years he was appointed foreman of the Southport Gas-Works, and personally superintended the laying of mains in the town. Subsequently he filled for five years the position of Manager of the Carnarvon Gas-Works. Then returning to Southport, he commenced business as an ironmonger. He was elected to the Town Council in 1870, and continued therein till 1881; and he re-entered it in 1888. He was an active member of the Gas and Electric Lighting Committee; and the wish was recently expressed that his mayoralty might be distinguished by an extension of electric lighting in the town.

Ruscoe's Conveying and Elevating Machinery for Gas-Works.—We learn that Mr. J. Ruscoe, of Hyde, has designed a new conveyor and elevator which he is supplying to The Gaslight and Coke Company for the conveyance of coal to the inclined retorts in course of erection at their Bow Common works. In ordinary scraper conveying, the power exerted has been far removed from its work; and the leverage of the scraper at its extreme point is so great that it is easily twisted and put out of condition. The feature of novelty in the new conveyor is the reversal of this order; the scraper being of such a character that not only is it rigid, but works cleanly and without noise, while the driving is in a direct line, and the connections secured in such a way that it is a continuous or endless chain. It is claimed for the new arrangement that by its use there will be less liability to breakdown; while the wear and tear will be very slight indeed.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Discussion on Mr. Chadwick's Paper.

In the JOURNAL last week, we published the paper, on "The Stacking of Coal, and Coal-Haulage Machinery," read by Mr. John Chadwick, of Oldham, before the members of this Institution on Saturday, the 25th ult. To-day, we complete the record of the proceedings by giving a report of the discussion which took place on the paper.

Mr. J. CHEW (Blackpool) said he had had some little experience of machinery in gas-works; for he had all the machinery which he could possibly adopt in use at his works, where he had to deal with 25,000 tons of coal per annum. As the members all knew, the cost of dealing with a ton of coal, from the time it was deposited in the store until the gas entered the purifiers, was something like 3s. per ton; and it was with this item that they had to deal when they were considering the question of effecting a saving. Most of the improvements introduced by gas managers of late years, had been for the benefit of the men; the workmen had reaped all the advantage in being able to do their work with more ease and comfort. The introduction of charging and drawing machinery had certainly had this result; and if this machinery was not so perfect as they would like it to be, it had certainly made the men's work easier. It was the bugbear of the gas manager's life that, before he could consider any improvement, he had to be sure of the way in which the workmen would receive it; for some of them were not content even with eight hours a day and the easier labour of modern works. However, if they could lessen the demands of labour by the introduction of machinery, they would relieve themselves of the bugbear of their lives. Those of them who had experience of generator furnaces knew that their introduction had done away with drunken week-end shifts; and that the cooling of retorts was not now so common as it used to be. This was a step forward; and it took a certain amount of trouble off a gas manager's shoulders. Turning to the subject of stacking coal, Mr. Chew said his opinion was that fresh-got coal made the most gas, and of the best quality. In making their contracts at Blackpool, they stipulated for fresh-got coal; and they did not want to stock more coal than was required for times when deliveries could not be depended upon. Fresh-wrought coal was certainly worth from 6d. to 1s. per ton more than coal which had been stacked; and this fact must be taken into consideration. At the commencement of the recent strike, he (Mr. Chew) had in stock only one month's supply of coal; and since then he had had to buy 8000 tons at the higher prices. None of them, he supposed, anticipated that the strike would last sixteen weeks. For the haulage of coal, he thought the method described was the best that could be arranged. Different works would, of course, vary in their needs; but wherever machinery could be used, it should be used—for there was no comparison in regard to cheapness between hand labour and machinery. In these days, money was exceedingly cheap. Promoters of electric light schemes could raise capital on terms of repayment in thirty years; and he presumed that it could be obtained for gas undertakings on the same conditions—in other words, it would not cost more than about 4½ per cent. If this was really so, they ought to seriously consider how much machinery they could utilize. Mr. Chadwick had told them that he dealt with 34,000 tons of coal a year; and that the machinery for the purpose cost £3000. This was certainly not a large sum; and the point was important, because, as they knew, many gas-works were over-weighted with capital; and every addition to it had to be carefully considered. Still, machinery was better than the unmanageable labour with which they had to deal; and he (Mr. Chew) advocated it on the ground of economy, and because it did its work better and with less trouble. The only fault he could find with the system which Mr. Chadwick had described was that the coal had to be put below the ground-level, and then lifted up. This seemed to him to be a mistake, and a waste of energy. Nor did he believe in breaking coal, as was done by this machinery. Experience taught him that, if coal was broken too small, a considerable amount of trouble was caused afterwards by the fine dust being drawn into the ascension-pipes.

Mr. T. B. BALL: You get too much vacuum.

Mr. CHEW said they all wanted to get the largest amount of gas from the smallest amount of coal, and breaking the coal was a great mistake, for it increased the amount of dust, and was an obstacle to the introduction of machinery. At his works, he had one retort-house served by machinery, the charging power of which was capable of improvement; but the drawing part was excellent. He also used steam for moving the coal-waggons, without the intervention of a locomotive engine; and in his case, if the coal was to be stacked, it was put down at a lower level, while if it had to be lifted it was done by an elevator. The elevator was an excellent machine, though it wanted pretty close watching to make it pay. It was necessary to have duplicates of these machines, and to have them well cared for. The tendency to breakdown was in the accumulation of dust and water in the pit below the hopper.

Mr. ISAAC CARR (Widnes) remarked that Mr. Chadwick had brought this paper forward at a very opportune time. No doubt

if they had known how long the recent colliers' strike was going to last, they would all have had much more coal in stock than they had when it began; and the subject of stocking coal was, therefore, one which was largely in all their thoughts. Since he came into Manchester that afternoon, he had met a gentleman who had sufficient foresight—though he was in the midst of a colliery district—to put into stock before the strike began three months' supply of coal. Unfortunately, he (Mr. Carr) had only six weeks' supply; and he at first felt pretty confident that with this he should see the whole thing through. No doubt the prolongation of the strike over so extended a period would make them all do something in future to provide against a similar difficulty. The arrangement which Mr. Chadwick had described seemed to be an excellent one of its kind, and to have numerous points of advantage. The mechanical arrangements appeared to be very clever. Mr. Chadwick remarked, however, that the geographical situation had a good deal to do with the adoption or otherwise of machinery of this kind; and he (Mr. Carr) did not see the advantage of this arrangement over the Beckton system—one which had been adopted in many Lancashire works. If they had the coal-store low enough, and the railway high enough, with the line of rails passing the whole length of the retort-house, this system was excellent. On the other hand, if the works were so situated that a line along the end of the retort-house only was possible, the arrangement described by Mr. Chadwick would be of advantage. He (Mr. Carr) failed, however, to see where there was any gain—in fact, he should think Mr. Chadwick's arrangement was more costly than the Beckton system. As he understood from the description, the motion of the belt described in the paper was longitudinal only. The angle of repose of slack was about 45°; and so, unless there was a lateral motion of the belt, it seemed to him that the stack of coal in the retort-house would require a great deal of manual trimming.

A Member remarked that it would be just the same with an overhead railway.

Mr. Carr said that was just the point which he was trying to get at; for he did not see the advantage which this arrangement possessed over an overhead railway. The coal would not fill up from the railway without manual trimming; and he thought the same objection would obtain in regard to this travelling belt. An important point was, How much did it cost to stack the coal before the introduction of the machinery? If works were in a bad situation, and it was very costly to get coals into the place, and a system of this kind would take 3d. or 6d. a ton off the cost, this would be sufficient to recommend its adoption. As Mr. Chew pointed out, money was now very cheap; and if, by the introduction of machinery, they could save a few pence per ton of coal, it would be a great advantage.

Mr. G. E. Saville (Todmorden) asked if the author of the paper did not find that the quality of the coal which had been broken deteriorated faster than that which was unbroken?

Mr. A. Shires (Kidsgrove) was astonished to hear from Mr. Chew that the loss by stacking coal was from 6d. to 1s. per ton. As to the breaking of coal, he certainly did not see the advantage of it; for it would be better to buy nuts at a lower price, than buy round coal and then have to break it.

Mr. S. Glover (St. Helens) said he had had similar experience to that of Mr. Chadwick with regard to haulage machinery; and he could see an advantage in an arrangement of this sort, notwithstanding the loss which took place from the stacking of coal. As to Mr. Shires's objection, all that could be said was that they were not all able to buy nuts; and if they were going to use machinery of this kind, it was much better that the coal should be broken than that it should be dealt with as it came from the pits. For stacking coal in small works, he recommended a jib-crane. He put down some coal in stock in the yard at the St. Helens Gas-Works; and he found a jib-crane very useful in picking it up again and removing it to the retort-house. It seemed to him that they were coming to a time when it would be desirable to have machinery not only to put coal into stock, but to take it out of stock. In Mr. Chadwick's case, the belt returned immediately underneath that portion which was carrying the coal; but it seemed to him (Mr. Glover) that much would be gained if the belt could be so extended as to return by a subway under the floor of the retort-house, with suitable openings at intervals, so that the coal could be carried by this means from the store to the elevators of the charging machinery, and so tipped into the fixed hoppers. He was surprised to hear that the whole expense of this apparatus—especially when he found that it was in duplicate, and that alterations had to be made in the yard and in the drains and so on—was only £3700. The cost was very low indeed. With regard to the difficulties of charging by machinery, to which Mr. Chew had referred, he could only say that he had experienced no trouble whatever; and he should certainly not like to feel that he was not safe unless he duplicated the machinery. It was true, the cost was only £2000; but he did not want to spend a similar amount in that direction at present. If he were going to erect a new retort-house, he should sink the coal-store very much deeper than hitherto. He had no objection to putting the coal into a hole for the purpose of getting it out again, if he could thereby gain an increase of storeage-room; for there was no difficulty in lowering the elevator to any reasonable depth. For the haulage of coke, the arrangement which had been described by Mr. Chadwick seemed admirable.

Mr. Chew asked if Mr. Glover had never had a breakdown of the strap, nor a choking of the elevator-pit.

Mr. Glover thought he had never had the elevator strap broken; and his was not one of the most modern arrangements. His practice was to have the pit at the bottom of the crusher cleaned out every week; so that there was never any accumulation of coal or coal dust to choke up the machinery. His experience was that the cost of repairs was very small indeed.

Mr. W. W. Hutchinson (Barnsley) remarked that the subject of the stacking of coal was one of much importance. They were advised by Mr. C. E. Jones, of Chesterfield, a few years ago to stack coal more extensively; and he (Mr. Hutchinson) had had some experience in this direction, though not with the use of machinery. His experience was that the best course was to stack coal of a suitable character, and hold it as a reserve for such an emergency as they had recently had, rather than to use from the older store, and put the new arrivals into stock. After the first twelve months, the depreciation of the value of coal in stock went on very slowly indeed. He had had a heap of 2000 to 3000 tons of coal stacked in the open to a depth, in some places, of 12 feet or 14 feet. Roughly speaking, the depreciation in two years was rather more than 10 per cent.; he was somewhat surprised to find it was so little. A stack of coal was preserved from the influence of the weather by covering it with a layer of pea-nuts, which would absorb the moisture when it rained, and give it out again when the sun shone, and so prevent it penetrating to the bulk of the coal underneath. Gas engineers would in the future have to stock coal in much larger proportions than they had been accustomed to do hitherto. In his opinion, wages disputes in the coal trade were largely the result of the constant fluctuations in the price of iron. The tables which were published with regard to the output of coal, and its use for various purposes, showed that the coal used for iron production was a variable quantity. For gas-making purposes, the quantity of coal required was in a gradually ascending ratio; and the fact was the same with reference to the domestic consumption. Just now, there was a movement in the direction of building more battleships, which would mean a larger demand for iron and a consequent stiffening in the price of coal. From the spirit abroad in Barnsley and its neighbourhood, he felt sure that the miners would not accept any reduction of wages if they could possibly (by strike or otherwise) avoid it; and his opinion was that gas-works should stock coal if the material could be had at a reasonable price. Most of them ought to have five months' supply. At the Barnsley Gas-Works, they provided a three months' supply. Three months' *stock* of coal did not mean three months' *supply* of coal, for they could not afford to run quite dry at a gas-works, and leave the neighbourhood in peril; so that three months' supply of coal really meant well on towards five months' stock.

Mr. Carr: Do you mean on the maximum or the minimum consumption? Would you say five summer or five winter months?

Mr. Hutchinson: I do not mean five months of winter.

Mr. Chew: Do you mean that we should have three months' supply at Christmas?

Mr. Hutchinson said he thought they ought to have all they could possibly get. Some coalowners had expressed surprise that gas managers had been able to keep up the supply as they had done without having recourse to such large coal-fields as those of Yorkshire. This showed that, if the managers had possessed such large supplies as he had spoken of, things would have been very different. The miners really meant to leave everybody without coal; and they nearly succeeded in their object. In future, gas managers would not be able to depend upon coalowners stacking coal, because when they did so, and trouble occurred with the men, there was difficulty in getting it away. A miner who had coal in his cellar would be very much aggrieved if anybody wanted to prevent him from fetching it out. But miners did not hesitate to prevent coal from being removed from the pit bank; and coalowners who had kept up prices at the request of the men, and had had to stock their coal in consequence, had been the chief sufferers from this policy. One of the arguments of the miners was that gas companies and corporations should be made to pay more for their coal. He took it that the owners of gas-works were really the friends of the miners; and it was news to him that those who were considerable consumers of an article should be branded as the enemies of those engaged in its manufacture. They had certainly been compelled to buy coal at a very high rate at times; and they ought to have the advantage when it was cheap.

Mr. T. B. Ball (Rochdale), referring to the machine described by Mr. Chadwick, said he was rather surprised to hear that the belt was composed of cotton cloth stitched together. He supposed it was rather stiff cloth. He should also like some information as to the means by which the coal was kept on the conveyor until it reached the point at which it was turned off. Mr. Glover had referred to the question of taking coal out of stock again. He (Mr. Ball) believed this had been done by The Gaslight and Coke Company at their Kensal Green station. He was very much interested in their design for handling coke; and he should like to see it in operation. The difficulty of dealing with hot coke seemed to him insuperable. He knew one place where it had been attempted; but the attempt ended in dismal

failure. For the first two or three days, it promised to be quite successful. The water and the hot coke, however, heated the trays, and turned them up into all sorts of shapes; and it became quite impracticable to make them work. Mr. Chadwick said that the handling of his coal cost him 4d. per ton; also that the whole expense of his conveyor amounted to £3700, and that, if 5 per cent. depreciation and 3¼ per cent. interest were allowed, it left a balance of £25 to the good. He (Mr. Ball) did not think this was such a saving as would secure the adoption of this machinery in many works. Practically, they would be just where they started after getting this installation put in, with the advantage that they could deal more quickly with the material. So far as pounds, shillings, and pence were concerned, they would have no gain, or hardly any worth mentioning, because he did not think 5 per cent. was too much to allow for depreciation; and if, in dealing with 35,000 tons of coal, they could only save £25, some of them would have difficulty in persuading their directors and committees to expend £3000 or £4000 on the machinery. In most gas-works, however, it would cost more than 4d. per ton to put the coal into the store. There was, of course, the advantage which Mr. Chadwick had mentioned, that they could deal with a large quantity of coal in a small space of time, without having the trouble and inconvenience of increasing the staff at short notice. But, on the other hand, something might go wrong with the machinery; and then the whole thing would be at a standstill.

Mr. R. Porter (Elland) remarked that he had had some experience of machinery for handling coal; and the paper had therefore been extremely interesting to him. Mr. Chadwick had referred to the tipping of waggons of coal, 10 tons at once, into the hopper of the elevator. How did he get over the difficulty of having the elevator choked? for if he tipped a waggon load of soft pit coal on to the breaker at once, he (Mr. Porter) did not see how the machine was going to deal with it. He did not see the advantage of breaking coal and then storing it for a long time. Why should it not be handled and stored in the way in which it came from the pits? Another question he should like to ask was as to the width of the band of the conveyor. Mr. Ball had referred to the question of cost; and certainly the saving, which seemed to be about 0·82d. per ton, was very small on the large quantity of coal Mr. Chadwick had to handle. At Elland the gas-works were in close proximity to both the railway and the canal. They approached the Railway Company with regard to better facilities for receiving the coal, and were told that, if they were prepared to lay out £3000 on a siding, the Company's engineers would consider the matter, and report upon it. As they had only about 8000 tons of coal to handle every year, they were not prepared to spend so large a sum; and therefore they had to consider other means of overcoming their difficulty. One question was whether they should deepen or lengthen the coal-store. If it were lengthened, the cost of bringing the coal back to the retorts would be greater; while if it were deepened, it would be impossible to get the coal out by hand. He decided upon the latter course, and fixed up an elevator. The coal came by canal, between which and the coal-store there was a towing-path. They had consequently to have a moveable elevator over a width of 14 feet; and it had also to accommodate itself to the rise and fall of the boat, which was 4 feet. The hopper was filled by hand; and the coal was conveyed on a band across the towing-path, and then delivered into another hopper, and so on to a second band, which ran at right angles with the building. The appliance was constructed to deliver at the rate of 20 tons per hour. It did not enable them to dispense with manual labour; but it rendered them independent of outside labour.

Mr. C. Wood (Bradford), referring to the subject of the deterioration of coal in stock, said he thought a great deal more had been made of this than was warranted by the facts. He had carried out some experiments with Yorkshire coal which was stocked in 1888. In the first two years, there was slight deterioration—amounting, perhaps, to 10 per cent.; but after that, if it was hard coal, there was not much. If coal was stored under cover, there was very little indeed. It seemed to him to be a mistake to break coal before stacking, for small coal deteriorated more rapidly than unbroken coal. They were all, no doubt, agreed that in large works it was economical to have machinery for dealing with the coal. That which was stacked was perhaps only 15 or 20 per cent. of the total consumption; and the interest and depreciation would, he thought, go a long way towards making up the expenses of working. Something had been said about the trouble which elevators for dealing with coal might cause. At Bradford they had had experience with machinery of this kind for the last three or four years; and he could not recollect any instance in which great difficulty had arisen. They had not had a single belt broken. As to Mr. Hutchinson's suggestion that they should store five months' supply of coal, in the case of Bradford it would amount to something like 50,000 tons stacked up; and the interest upon this would be a rather serious item. Personally, he was most interested in what Mr. Chadwick had said as to coke-conveying machinery. The greatest trouble they had with machine stoking was that of dealing with the coke afterwards.

Mr. J. West (Manchester) remarked that in the Manchester district it was not customary for gas-works to have such large stocks of coal as they did in the South of England; but his opinion was that it was desirable to have them, in order that they might be protected against strikes. In the South, where they depended upon supplies of seaborne coal, they were compelled to stock largely; and, as a rule, they held three months' supply, which certainly was a great protection. No doubt there was a deterioration in the quality. Mr. Jones told them some time ago that, if they could give the colliery proprietors orders for a steady, even supply, they would get the coal cheaper; and the reduction in price would go a long way to compensate for the interest which would have to be paid on the coal that was stacked. As to the use of machinery for the haulage of coal, it all depended upon the position of the works. A high-level railway was, no doubt, a very admirable system. At the same time, it was very expensive; and at Oldham it would have cost a great deal more than the elevator machinery. They generally made the conveyor machinery form part of the roof; and they thus obtained more height than was possible by a high-level railway. This was an important factor in connection with coal storeage; for the object was to get as deep storeage on as small an area as possible. The question of wear and tear used to be a great difficulty; and he was glad to hear from Mr. Chadwick that in this respect the machinery was satisfactory. If they had a little water at the bottom of the pit, and the fine coal accumulated there, a very hard mass would be formed; and there was danger of a large piece of coal catching against this obstruction, and throwing a great strain upon the whole of the apparatus. This could be prevented with care; and the danger would be avoided if that were cleaned out every week, as was done by Mr. Glover. As to the question of the size of coal, all he could say was that there was great difference of opinion on this subject among gas engineers. Machinery could be constructed to break coal to any size required. There was also the point mentioned by Mr Chew as to the depth of coal-stores. At the East Greenwich works of the South Metropolitan Gas Company, they had gone down some 12 feet below the basement level, in order to get increased depth; and the store there would be a total depth of 25 feet. The subject of conveying coke had received his attention. Some experiments had been worked out by Mr. Charles Hunt and himself; and he had no doubt that the apparatus would succeed. He was working in the direction of putting up stronger machines than formerly. Gas-works machinery had to work night and day; and it was necessary that the mechanism should be stronger than the ordinary engineering theories provided for, so that the wear and tear might be reduced to a minimum.

Mr. W. S. Haddock (Warrington) referred to the method used at his works for dealing with the coal, and said it would not cost 2d. per ton. The waggons were opened and the coal delivered in the store at the rate of one waggon every quarter of an hour.

Mr. Chadwick briefly replied to the various objections which had been raised. He agreed that it was desirable to have freshly-won coal; but they could not get it in the winter, and stacking to some extent was therefore a necessity. As to breaking coal, he did not believe in breaking it too small. They could not all buy nuts, as Mr. Shires suggested they should. At Oldham they had coal of all sizes; and, as he explained in the paper, the smaller pieces went through the breaker, while the larger lumps were broken. If they were sending nuts through, they would not be broken; while if they were sending soft Durham coal through, they would put a baffle-plate in, so as to prevent it getting into the pit faster than the elevator could take it up. The rollers could be altered, and the coal broken to any size. In his case, he did not keep the coal in stock for any length of time, as he was constantly using it. They had no stoking machinery, so that they had to handle all the coal as it came out of store. The calculation he had made as to the amount saved by the use of machinery included the interest on the outlay and the estimated wear and tear. In three years' working, the only breakdown was when the strap broke once; and the cost of repairs had only been about £10. The band of the conveyor, as he had explained, was made of layers of cotton cloth, which was strongly woven; and they occasionally ran hot tar over it to preserve it. So far, more than 100,000 tons of coal must have gone over it; and it would last many years longer. It was about 26 inches wide. The top pulleys on which it worked were hollowed a little; so that the coal falling on the band had a tendency to "dish" itself. This, however, was not necessary; and a flat belt would, he believed, be better, for the coal had no tendency to work off the edges.

A hearty vote of thanks was accorded to Mr. Chadwick for his valuable and interesting paper.

Death of Mr. S. J. Smith.—The death is announced of Mr. Samuel Joseph Smith, one of the Engineering Inspectors of the Local Government Board. The deceased, who will have been known to many of our readers in connection with the duties of his office, was in his 65th year.

Death of Mr. H. J. Fisher.—We regret to announce the death of Mr. H. J. Fisher, one of the oldest officials connected with the Kent Water-Works Company. The deceased, whose death occurred somewhat suddenly on Monday evening last week from influenza, had charge for many years of the important district of which Sidcup is the centre, and by his natural urbanity did much towards cementing the good understanding between the consumers and the Company.

THE LAING OIL-GAS PROCESS.

At the Meeting of the Royal Scottish Society of Arts on Monday, the 27th ult.—Dr. TAYLOR in the chair—the following paper, which was illustrated by a diagram,* was read by Mr. J. LAING, of Newington, Edinburgh :—

OIL GAS AND BYE-PRODUCTS FROM MINERAL OILS.

Two years ago, I had the honour of bringing before the Fellows of this Society a paper on the "Destructive and Conservative Distillation of Mineral Oils;" and I may mention that what I am now about to ask your attention to for a few minutes is the outcome of extended experiments on the subject of destructive distillation. Some of you may remember that I pointed out three methods by which mineral oils can be "cracked up" or decomposed. One method was by repeated distillation; another by distilling under pressure; and another by radiant heat—as by passing the oil vapours from a still distilling oil through a superheater, where those vapours come into contact with the radiant heat found there, they are thus further decomposed or broken down. While working with the last-mentioned apparatus, I had some trouble in regulating the heat in the superheater I used. If I employed too high a heat, I had my oil "cracked up;" but I also had too large a quantity of gas formed of an incondensable character. It was while facing this latter point that the thought struck me, Why not convert the whole of the oil into gas? I extended my superheater, and gave it the necessary temperature; and I was quite pleased with the results I obtained.

In order to have a perfect apparatus, several difficulties had to be overcome. When working at a very high temperature in the superheater, as I had it, I found that there was a tendency to have a deposit of coke; and as this was undesirable, the question naturally came to my mind, How can I prevent this tendency to deposit coke, and yet get my gas rendered permanent by using a lower temperature? It then occurred to me that, if I could condense the heavier and more condensable hydrocarbon vapours before they reached the superheater, I could then deal with the lighter vapours and convert them into permanent gas at a lower temperature than what I would require to attack the full flow of vapours as they came from the still. I accordingly fitted up a condenser between the still and the superheater, and allowed the more condensable vapours to be condensed and return to the still for re-evaporation and condensation. By this method, I got much better results, and no incrustation of carbon, to speak of, in my superheater. But here another difficulty met me—and a serious one, too—in the presence of water along with the oil in the still. When the temperature of the boiling-point of the water was reached, steam was formed and left the still; but readily condensing in the condenser, it returned to the still in the form of water. As the temperature of the still was increasing, the result was that this water, on re-entering the still, immediately burst into steam, and was capable of doing mischief from the sudden pressure it exerted on the plant. To get over this, I introduced a piece of apparatus between the lower end of the condenser and the entrance to the still, which acted as a water-trap. This water-trap caught all the condensed material from the condenser; and, as water is heavier than oil, it accordingly sank to the bottom. The overflow of oil from the surface returned to the still perfectly free from water; and during the remainder of the distillation, there was no possibility of further trouble or anxiety on account of water in the still. This trap is fitted with a cock at the bottom of it; and when you turn it on and find oil present, you may rest assured that no water is there to be dealt with. Sometimes it happens that water is present in the oil-tanks from which the oil is barrelled; and if the tank is well run down, some water may have got into the barrels among the oil unperceived. In this way, water may find its way into a still when being charged from the barrels or tank; but with the arrangement I have here mentioned, no harm can result from its presence in my form of apparatus for the manufacture of oil gas.

In the form of apparatus I have adopted, I get the benefit of a combination of the three methods of cracking oils I have already brought before you. [Of course, you will understand that the conversion of oil into gas is nothing more than "oil cracking" carried to the extreme.] There is the re-distillation and condensation, as shown by the condenser coil in connection with the still. Then I get the back pressure on the still from the weight on the gasholders, which enforces distillation under pressure; and then I have the direct action of radiant heat in the superheater.

In the form of superheater I am using at present, I have a number of discs with holes punched over the one-half of each disc; and the edges of the discs are vandyked or niched. These discs are fitted on to an iron rod, at regular intervals from each other. The end disc has its holes downwards, the next one has its holes upwards; and so on to the end, thus giving the gas a zig-zag travel, and making it come in closer contact with the radiant superheater. My reason for giving the gas this kind of zig-zig travel is to ensure a uniform quality of gas being made. If you merely pass the gas through to the superheater direct, then the portion of it which is nearest the sides of the vessel is decomposed the most. The central portion is of a heavier nature; and I am strongly under the impression that this mechanical mixture of the molecules (if I may use such an expression) is one great cause why some makes of oil gas smoke so badly when being consumed in the burners. If the hydrocarbon molecules are of a uniform character, then you will have a gas which will give satisfactory results on being consumed. I am quite aware that a proper size of burner should be employed for burning very rich gases; but what I mean to convey is this, that using two makes of oil gas, and consuming them side by side under the same conditions in every respect as to burners, pressure, &c., you will find that the gas which has been the result of uniform decomposition will give more satisfactory results than the gas which is not so uniform in its composition—being more a mechanical mixture of its component parts than a chemical one. Oil gas of uniform composition blends immediately with coal gas, and, I believe, has no tendency to layering in large holders; and accordingly you should have no variation of illuminating value from different heights of the gasholder. Some people seem to think that oil gas does not store well, and loses a great deal of its illuminating power, if it has to travel far. Now this is quite a misconception; for really the fact is that, if oil gas is properly made, it will store better and travel better than coal gas will, for coal gas depends more on condensable vapour for its illuminating power than oil gas does. In some other processes for oil-gas making, the oil is injected or run in a stream into the heated retorts or stills. In this way, the oil is at once flashed into vapour; what has been rendered permanent goes to the holders, and what condenses again into oil is returned to the still. By this method, you obtain an immediate deposit of coke, which goes on increasing in thickness as long as the feed continues to supply the oil. This coke, as you all know, is a very bad conductor of heat; and it necessitates more heat to be forced into the still as the operation of gas making continues, in order to decompose the oil coming into it. By such methods, you will see that the resulting gas is very apt to be of a mechanical mixture nature, owing to part of the oil vapours not having come in sufficiently close contact with the heat necessary for their thorough decomposition. The great heat necessary to pass through all this increasing thickness of coke, I fear will soon prove a destructive agent on the plant itself, by burning it through.

By my method, I never require a higher temperature than a very little over the distilling or boiling point of the oil to be used. I charge my still with a quantity of oil consistent with the number of cubic feet of gas I wish to make; and I distil this down to a thick bottom, and run it off as pitch. I have practically a clean still left for the next day's charge. If you prefer having a large size still, then you may work on a large body of oil, distil down as many inches as you require, then draw off the heat and leave the still as it is till next time for making. Nothing leaves the still but vapours, the condensable portion of which continuously washes down the condenser coil and other pipes connected to the still, and keeps them absolutely free from deposit. All the dirt remains in the still; and the cruder the oil used, you have a greater or less quantity of pitch formed. This bye-product is much more valuable as a commercial article than coke. If you allow the distillation to continue to dryness, then, of course, you will have coke formed; but it is better to stop the distillation while the residue in the still is liquid, and it is readily run down, leaving the still practically clean. I may here mention that I have arranged a special pitch-cock, which will save a deal of trouble by its being easily kept free from plugging up. In the ordinary cocks at present in use, the box or hole in the plug of the cock generally retains some of the pitch; and as it cannot escape when the barrel is turned off, it remains and hardens there, and, before another run-down can be made, time must be allowed for the hot pitch behind the cock to melt out the plug in the cock-barrel. This is sometimes rather difficult to get over; and a steam-jet has to play on it for some time before it will clear. To get over all this, I got a cock specially made with a "pap" cast on the one side of it. A hole was then bored through this into the plug-box; so that, when the cock was turned off, a hot wire could easily be passed into the plug-box, and the hardened pitch removed. A screw-plug fits into this hole. This method is extremely simple and most effective, and far better than the present system of running a red-hot rod up a pipe in line with the cock, and with the cock turned on riping it out. Sometimes the stoppage gives way with a burst; and there is great danger of the person so operating being seriously scalded with the hot pitch from behind coming quicker than he can get the rod removed. With my arrangement, large or small works are equally served; and no duplicating of plant is necessary for large works. You only require to have a larger or smaller still and condenser in proportion, consistent with the amount of gas required.

Any kind or quality of oil can be employed with absolute confidence. I prefer to use the ·865 or ·840 unwashed home oil, as the gas made from it requires no lime or other purifying treatment. If you use an oil too near the crude state, it would be better to pass the gas made through purifiers, so as to remove all sulphur and ammoniacal compounds, which are apt to be present at that stage. No skilled labour is required. Keeping up a distilling temperature is all that it is necessary to

* An illustrated description of Mr. Laing's apparatus was given in the JOURNAL for the 21st ult., p. 940.—ED. J. G. L.

give special attention to. The cost of the plant is not great; and the expense for upkeep should be exceedingly small. The space required is very small indeed. Eight feet square would be sufficient for a works requiring 20,000 cubic feet of oil gas or more per day. There is nothing to get out of order—there being no mechanical parts requiring attention. The attendant never requires to soil his person or dress. As in a coal-gas works, the air is not polluted with offensive smells.

Where oil gas is being consumed, it should be burnt at less pressure than that used for a poor coal gas; and a size of burner should be used which will just prevent smoking. If you use burners much below this point, you get a very much poorer light per 5 cubic feet burnt, owing to the cooling of the flame. It has been shown that a No. 0 Bray, showing 50 candles per 5 cubic feet burnt, and giving a good smokeless flame, would, if the same gas under the same conditions was burnt in a No. 000 burner, show a loss of 35 candles from the same amount of gas consumed per hour. I find a burner passing about 1¾ cubic feet per hour will answer very well for general requirements.

By arranging a $\overset{A\ B}{\top}$-piece outlet on the still, provided with cocks A and B, as shown, you can have a very useful combination of still suitable for oil and gas making combined. Suppose you have an oil which contains some light material you do not wish to retain, you can convert that portion of it into illuminating gas in the method described, and then by shutting off the cock at A and opening B, you can convey the rest of the vapours of the heavier remaining oil to an ordinary worm condenser, and then run them off in the usual way as heavy oil into the receiving-tanks, at the same time shutting off the heat from the super-heater, as it would not be required. Should a plant be desired for the combined purpose of making gas and refining oil, it would be well to have provision made for a furnace to assist the surplus heat from the coal retorts (if such heat is being utilized), because a smarter heat is better for distilling oil than for gas making, for the reason that, if your oil vapours are kept too long in the still in contact with the radiant heat there, you would have your heavy oil vapours decomposed, and a lighter oil would be the result. The lower temperature at which you can distil mineral oils will yield you the heaviest qualities, and of greatest viscosity.

It is not my intention here to further occupy your time in bringing forward the advantages claimed for the use of oil gas. These claims have been well ventilated here by others, and also in the public Press; but I would just say that I think all gas companies should have an oil-gas plant—in reserve, at least, if not in actual work—for, should they run short of coal, through miners' strikes or other causes, they can yet prevent in a great measure having their towns left in total darkness, by the timely use of their oil-gas plant. You can calculate on getting 100 cubic feet of gas of high illuminating power from each gallon of oil; so the space required for storing an enormous quantity of oil gas in a latent stage (if I may be allowed the expression) is not very great. The question of cost has been well wrought out, and is before the public; and I may only say that, if you are using the surplus heat alone for your oil-gas plant, then the cost of the oil gas is practically the cost of the oil you are using.

Discussion.

The Vice-President said he should like to know if it had been settled what was the composition of the oil gas Mr. Laing had described; and whether the condensation he spoke of as belonging to coal gas was not also attendant upon oil gas. He would also like to know whether the gas was suitable for engines, because, if it were, he thought it might facilitate the installation of electric light in small communities where the question of coal carriage was of considerable importance.

Mr. D. Bruce Peebles (Edinburgh) said he was sorry he had not the necessary knowledge to criticize the paper as he would like. Oil gas was, however, a subject which had lately risen very high in discussions in connection with gas. There was a gas which had its origin in the town bearing the unfortunate name of Peebles, and with which he had nothing to do; but he was being continually asked: "What is this new process you are bringing out?" He wrote to Mr. Young, the inventor of that process, asking him to be present that night, if possible, in order that they might have the matter thoroughly thrashed out; but, unhappily, Mr. Young had been ill with influenza for a fortnight, and could not be with them. He (Mr. Peebles) would like to know, as between the two systems, which would most conduce to economy. He could not say he agreed with Mr. Laing that oil gas should be burned at a lower pressure than other gas. So far as his experience went, a gas of low quality required a very low pressure. For oil gas, the burners had to be very small. He should like to know what illuminating power gas Mr. Laing produced. He himself was not particularly partial to high quality gas. Professor Lewes recommended one of 14-candle-power; and he himself was convinced that gas of 20-candle power would be far more suitable for gas-engines and gas-fires than gas of 26 or 28 candles, such as they had in Edinburgh. He thought Mr. Laing should take advantage of the North British Association of Gas Managers, where he would have a very kind reception, and where the members would be very happy to go hand in hand with him in any experiments he might make. He understood the process was in operation at Linlithgow; and so they would soon have practical results. There was the question of pitch or coke which would have to be discussed. Mr. Laing said he obtained a better product than Mr. Young. The latter gentleman had, however, a very high quality of coke; and the question would be which was the more economical of the two.

Mr. Laing said that, as to the composition of the gas, he was not prepared as yet, from his own knowledge, to give any particular mechanical analysis of it, as he had been too much engaged in the practical and commercial part of the question to take up that point. But there were various analyses which had been made; and it might be taken for granted that they were much the same. He had not tried the gas in gas-engines, for the very good reason that he had not had an opportunity; but, from what he had heard from other people who had experimented with oil gas, it was considered that it was better than coal gas. It seemed that, instead of the smart explosion which occurred with coal gas, they had more of the expansive or steam action. As to the storeage of oil gas, if properly made there was very little that was condensable in it. He had had it standing in a freezing mixture for a considerable time; and it had hardly any effect upon it. Mr. Peebles had referred to the comparative value of the Young and Laing processes. Well, it was very natural for him (Mr. Laing) to think his was the best; but, apart from that, in the Young process they had a dry vessel, and the carbon adhered to the side of it, and they had an increasing deposit of coke. He thought it was 5½ cwt. of coke per ton of oil that the Young process yielded; and, of course, the increasing thickness of coke necessitated raising the heat put into the retorts. In the process he had shown the meeting, he had nothing of that kind. The heat practically continued to the close; and they had a liquid from beginning to end. With regard to the price of coke as against pitch, it was a matter for themselves to decide. If they wanted pitch, they had only to take it out; but if they wanted coke, they had only to continue it. He thought that, in a question of plant, they would turn it out. Another great advantage was that, when they opened the still to run off the pitch, the still drained itself, and became dry. They did not require to go in and chip out coke. What he meant by his observations about pressure was that they required very much smaller burners for oil gas than for poor gas. With regard to the illuminating power, he thought a very good power to send out to consumers was about 30 candles. In order to get this, what he proposed was to use a very poor splint coal—the cheapest coal they could get—giving 18-candle gas; and if they took five portions of this gas and one portion of oil gas, they would supply to the consumer a 30-candle gas. The oil gas was of at least 90-candle power.

Mr. R. Mitchell (Edinburgh) could not make out Mr. Laing's reference to water in the oil. He said his experience of oil manufacture was that there was no water at all in an oil of ·870 specific gravity.

Mr. Laing: The water is not in the oil necessarily; but when oil is run in, water may get into it.

Mr. Mitchell said he never saw it, in all his experience. Mr. Laing had given them experimental results, but not any information as to running off the pitch or with regard to the quantity of pitch that was produced per ton of oil. They had heard from Mr. Young that he had a residuum of 5½ cwt. of coke per ton of oil. He thought that, if they had this quantity of hard, dry coke, they would require to get from 7½ to 8 cwt. of soft pitch. The working of a still as compared with working Mr. Young's retort was open to question. He should think the Young process, seeing that the retorts only required to be opened once in 24 hours to remove a small quantity of coke, was preferable to one in which it was necessary to use a red-hot bore to run off the pitch. They obtained a marketable article in the one case, and a dirty sludge, which they could not get a market for, in the other. So far as the using of the still was concerned, they would get a very good result at a low temperature. But if they commenced cracking up the oils at a high temperature, they would begin to fail in what they were aiming at; they could not possibly get it. He did not wish to say anything about other processes, because there were so many in the field now; but, so far as he could see, Mr. Laing's might, so far, be successful, though he thought there was something left for that gentleman to attain to.

Mr. Kinloch Anderson (the Convener of the Works Committee of the Edinburgh and Leith Gas Commissioners) said the Gas Commissioners had the subject of the manufacture of oil gas before them at the present time; and they were very much indebted to the pioneers who had put before them the different schemes. They had not yet come to a decision, but were open to conviction that there was still a better process; and, if Mr. Laing showed them that his was the best, they might be able to give it further consideration. He was very hopeful that there was a great deal in the manufacture of gas from oil. It was going to serve an important purpose in helping them to cope with the congestion of the coal market which sometimes occurred; and possibly, in the case of a strike, it might serve a good purpose.

Mr. J. Milne (Edinburgh) remarked that, being interested in the other process, he could not, of course, draw any comparisons. As regarded the product, they would naturally have a smaller yield of gas and a larger yield of pitch. He did not think there would be any difficulty in disposing of the pitch. Mr. Laing had referred to the loss of heat in retorts, from the caking of coke. He was inclined to think he was slightly

wrong. He was open to correction; but he was under the impression that the coke in the Young process formed in the bottom of the retort, and did not retard anything going through. There was not much loss of heat in the retort. As to the burning of gas in cities, he could not agree with Mr. Laing. He thought that gas of from 20 to 22 candles was far better than that of 26 to 30 candle power. He had the curiosity to look into Mr. Laing's patent; and he found that he had been about this matter for a good while. He noticed that his first application was on March 17, 1890; and he saw that Mr. Laing had had altogether five patents. It looked to him as though Mr. Young and Mr. Laing had been jumping about the same centre; that they had started with destructive distillation, and had then taken different routes. There was no doubt both had done a great deal of good, and had afforded much information.

Mr. MITCHELL said that there was one point of which he omitted to take notice in his previous remarks, and that was with reference to the use of the gas for engines. Some years ago, they had a very extensive series of experiments, as to gas of from 16 to as high as 28 candle power, at Birmingham; and the diagrams given showed that the higher the quality of the gas, the more efficient was the action of the engine.

Mr. HUNTER (Edinburgh) said he had seen the Young process, but not that of Mr. Laing; and he hoped they would be invited to inspect the latter at Linlithgow, so that they might be able to compare one with the other.

Mr. J. MACFIE (Edinburgh) remarked that he was not able to offer an authoritative opinion as to the process before the meeting. He had seen that of Mr. Young at work, and he thought it a beautiful operation. What he would like to know about Mr. Laing's process was as to the permanency of the gas. Until Mr. Young's system came out, the manufacture of oil gas was only experimental; and it was generally asserted that no gas of this kind was permanent. He understood Mr. Young claimed to have overcome this difficulty, and had produced a permanent gas. He thought Mr. Laing had indicated that his was a permanent gas; but he (Mr. Macfie) considered he might be a little more definite upon the point. Nothing had been said as to the value of the coke produced. He understood that at Peebles from 20s. to 21s. per ton had been realized for it; and he believed there was a demand for it for certain metallurgical purposes. It was true that it caked in the retort. But it was very easily withdrawn; and he had not seen it stated that the caking reduced the efficiency of the retort. It seemed to him that the heat which must be required to bring the oil up to the proper temperature would be as great in the one as in the other. He supposed Mr. Laing would admit that his process was more of an experimental one than Mr. Young's. He was sure they all wished Mr. Laing success with his process.

Mr. J. GRAHAM-YOULL (Edinburgh) thought the water-trap was a valuable thing. As to the pitch, it appeared to him that it would be a very much cheaper way of getting rid of the heavy portion of the oil than by coking it. The pitch they obtained by Mr. Laing's process would sell at from 27s. to 30s. per ton at the works; and if a little more of the oil were taken out of it, it might realize from 36s. to 40s. per ton. He had seen a still with 4 or 5 inches of coke in it have liquid oil on the top of the coke. The carbon was a non-conductor of heat.

Mr. LAING, in reply, said he had seen an accident with water in oil which gave him a fright. The pitch he obtained had been referred to as "sludge." He did not think they could speak in this way of the sample he had produced. As to the use of the pitch, the process was in its infancy. The sample he had with him was not a perfect one. If he had been wanting to make a pitch for asphalting purposes, he would have distilled it down, and made it more brittle. Mr. Milne had referred to his "jumping about" patents. What that had to do with the matter, he did not know. The three patents he had taken out were not for gas purposes; they were for producing light oils from heavy ones. Perhaps Mr. Milne was aware that a large quantity of oil came from Russia, up to ·970 specific gravity, which was perfectly useless as it was. It would not burn, nor was it a lubricant, and it was not viscous. As a burning oil, it was too heavy—it smoked; and the question was, what they were to do with it. It was when looking for a process for this that he took out his patents. The only "jump" he had taken in the matter was when he found that in experimenting he had too much gas. At that time there was no demand for an oil process for making gas; but when this question arose, of course it naturally occurred to him to turn his process to account. He would be pleased to see the Edinburgh and Leith Gas Commissioners at Linlithgow. He might say that his experience just now was purely experimental. The plant which had been fitted up at Linlithgow was entirely an experiment. They had only made one night's gas by it; and, unfortunately, it was past twelve o'clock before they got up sufficient heat. They obtained a very good result. He was that day making arrangements to get a smarter heat upon the superheater; and in this way he would be able to have gas made in time to send it out to the consumers that night. He could not give an authoritative opinion as to the permanency of the gas; but he had kept it in his laboratory for 36 to 40 hours in a freezing mixture, and there was no change whatever in it. There was no doubt they could do with less heat with pitch in the still than with coke.

The paper was sent to a Committee for report.

AMERICAN GASLIGHT ASSOCIATION.

The Annual Meeting at Chicago.

(*Concluded from p.* 994.)

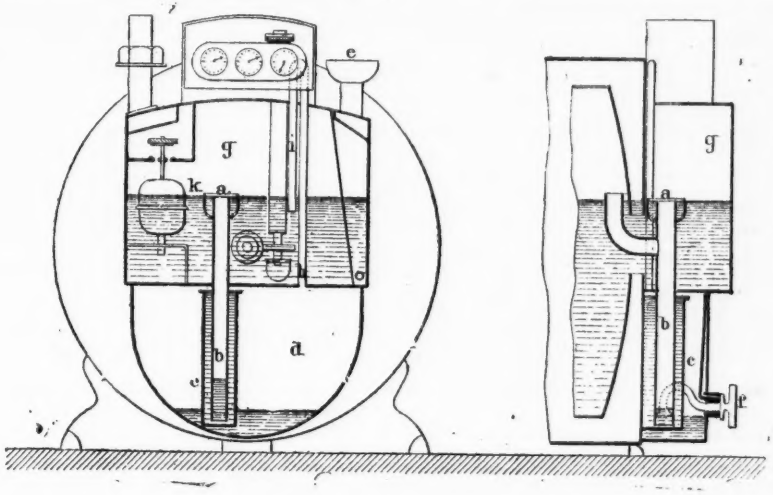
After the reading of Mr. Shelton's paper on "Gas-Engines," which we have already published in full, the President invited discussion; and Mr. M'Culloch raised the question of starting large gas-engines. He had an electric-light plant worked partly by a gas-engine and partly by steam; the two together being only required at maximum output. At present, the steam-engine did the irregular work, and the gas-engine came in as the reserve; but he would prefer to work the other way about. The difficulty in the way was the starting; and so he would like to hear more about the self-starting engine referred to in the paper. He had recently bought a second-hand 80-horse power steam-engine for about £120; and the cost of the boilers, furnace, chimneys, &c., was £400. He would like to know how the cost of an 80-horse power gas-engine would compare with this. Mr. Egner said that the previous speaker was right in claiming that the gas-engine would be cheaper than a steam-engine, when used for the irregular work of an electric plant. Mr. Shelton, in replying, said that a gas-engine cost something less than three times as much as a steam-engine of similar power; but it was cheaper than the engine, boiler, &c., fitted up complete ready for work. He described the self-starting apparatus in detail, and said it was indispensable in the case of large engines.

The Question-box was next opened, and its contents discussed. An inquiry for information as to the use of prepayment meters, or particulars of experiments with the same, met with no response. In answer to questions as to the relative fuel advantages of tar and coke, Mr. Egner said that, as the average result of several months' work in practice, he had found 1½ gallons of tar equal to one bushel of coke. Mr. Littlehales had found that a bed of six retorts, which required 36 bushels of coke per 24 hours, could be heated for the same period with 80 gallons of tar. On the subject of electric railway systems, and what protection could be devised against their effect upon mains and services, Mr. Butterworth suggested that the electric company should be induced to locate their works near the water-works or near a large water-main, so that the water system could be used for the return current. He had no trouble at Columbus; and he believed the foregoing was the explanation of such a satisfactory result. The President said this might do away with direct currents, but it would be powerless against induced currents. The injuries often occurred without actual contact. Mr. Thompson thought the difficulty was very general, and that it would be well to appoint a Committee to deal with the subject. Mr. Egner said that the reconducting back to the power-house by means of a metallic circuit was simply a sham. The current would go into the earth rather than follow a long conductor; and this was the reason why the electric people were glad to connect up to every gas and water pipe. Mr. Littlehales thought that the removal of the burden over to the water company could not be called a remedy. The pipes should not be used for electric returns, on account of the risks to the service and main layers who had to cut or work on them at times. His remedy was to move the pipes to a sufficient distance away from the electric system, the iron posts used to carry the overhead wires, &c., so as to avoid induced currents. Another question related to the effect of changing from direct firing to the regenerator system on the yield of tar and ammonia. Mr. Somerville said that both would be reduced. A few other subjects were discussed; and the meeting then terminated.

Books Received.—"Brown's Directory of American Gas Companies, and Gas Statistics for 1893." (*Progressive Age* Office, New York.) The scope of this work, which is compiled and corrected by Mr. E. C. Brown, is sufficiently indicated by its title. In addition to the information usually to be found in these annual volumes, brief explanations are given of the various gas-making processes mentioned in the book, as well as a number of "gas wrinkles" which have from time to time appeared in *Progressive Age*.——"Catalogue of Gas-Meters, Governors, and Gas Apparatus Manufactured by Messrs. W. and B. Cowan, of London, Manchester, and Edinburgh." This is an elaborately got-up catalogue, extending to 154 large quarto pages, of the various appliances employed in the measurement, testing, and supply of gas, with which Messrs. Cowan have been identified since the establishment of their business in 1827. They are all beautifully illustrated, and ample details are furnished in regard to them. Views are given of Messrs. Cowan's three factories; and the page of prize medals affords evidence of the quality of the work they turn out. As a specimen of letterpress printing, apart from its special value as a catalogue, the book is an admirable production.——"The Principles of Water-Works Engineering," by J. H. Tudsbery Turner, B.Sc. and A. W. Brightmore, M.Sc. (London: E. and F. N. Spon.) The object of the authors of this work, as stated in the preface, has been to provide, for the use of those who are engaged in the construction of water-works, an orderly and logical statement of the matters that specially occupy the attention of the engineer. A consideration of the way in which they have endeavoured to attain this object must be deferred till a future occasion.

AN IMPROVED INVARIABLE-WATER-LINE GAS-METER.

Excellent as have been the appliances constructed for ensuring unvarying measurement by wet gas-meters, it has been found by some that, while possessing to a very large extent the advantages claimed for them, there are certain attendant inconveniences in actual work. There is, for example, primarily the risk of syphoning; and then there is the liability to unsteadiness of light resulting from over-watering the meter or as the effect of condensation. These defects have been recognized by MM. Maldant, Dupoy, et Cie., who have devoted considerable attention to the matter with the view of remedying them. The result of their labours has been the production of a new meter, which is shown in the accompanying illustrations—one being a longitudinal, and the other a transverse section of the instrument. The feature constituting the novelty of the arrangement is the level *a*, which dips into a vertical tube *b*, plunging into the cylinder *c*, which forms a hydraulic seal, and is fixed into the water receptacle *d*. The cylinder has upon its upper rim a slit which allows any superfluous water to flow over into the receptacle—always maintaining the extent of the dip. The meter is supplied with water through the cup-shaped opening *e*, and the tube communicating with the rectangular box *g*; and any excess of water is drawn off at *f*. This outlet is placed as low as possible, so as to leave the greater part of the chamber *d* free to receive any redundant water at the time of filling, or resulting from condensation. In order to ensure the flow of water into *d*, it has been necessary to arrange for a possible communication with the outer air; and for this purpose there is a small tube arranged, corresponding to holes made in the seat of the screw-plug in the outlet *f*. When this plug is unscrewed, the receptacle *d* is in communication with the outer air; but it is isolated when the plug is restored to its position. Any air contained in *d* finds an exit, on the admission of more water, through the bent pipe *h*, which conveys it to the drum, where it mingles with the gas, and so passes away. The lower end of *h* should dip into the water to a distance corresponding to the extent of travel of the float *k*, in order to keep this valve closed. The height of the tube *h* is arranged so that the interior pressure cannot drive back the water from the rectangular box *g* into the receptacle *d*. It will be seen, from the foregoing brief description, that, if there happens to be an excess of water in the meter, it will flow by the pipe *b* and the cylinder *c* into *d*, while the air driven from this chamber will find a passage through the pipe *h* into *g*. The advantages which the makers of the meter claim for it are that, by getting rid of syphoning, the liability to unsteadiness of light, resulting from an excess of water in the syphon, is removed; and that there is no possibility of taking off unmeasured gas by attaching a pipe to the outlet *f*. As the hydraulic seal of the syphon is inaccessible from the outside, and the water contained in the cylinder *c* cannot be so acted upon as to unseal the end of the tube *b*, there is no way of fraudulently obtaining a supply of gas.



CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Hydro-Oxy Oil-Gas Process.

SIR,—While it is needless for me to defend myself before your readers from the insinuations which, in your *courteous* and *judicial* leader of this week, you have chosen to make against me personally, there are some specious arguments contained therein which, if left unchallenged, may possibly prove misleading to some.

When deciding on the form in which I should draft my paper for the meeting of the Southern District Association of Gas Managers, I chose the form I thought most suitable, and did not consider it necessary to accept the dictation of Professor Lewes, or even of the JOURNAL OF GAS LIGHTING. I considered, and still consider, that it is not necessary to endeavour to pick holes in other processes in calling attention to a new one; and—as I clearly stated in my paper—the Tatham process does *not* claim to be a new process for oil-gas making, but a process for improving rich oil gas, *however made*, by adding to such oil gas, preferably while still hot, a certain proportion of oxygen. It is to the advantage of the Tatham process to start with the best possible oil-gas process; and if the Young process is all that has been claimed for it, then it and the Tatham process may certainly be looked upon as friends and allies rather than as enemies. But considering the line into which the discussion has been forced by Professor Lewes and yourself, it is necessary for me to define clearly my attitude towards the Young process.

The manufacture of gas from oil has been known and studied for many years past; and some of the best known and most respected men among gas engineers have from time to time made public their experiences in this field. I think I shall have the concurrence of most gas engineers in summarizing roughly the experience of oil-gas making *per se*—before the advent of the Peebles process—as follows: (1) The higher the temperature at which the oil is cracked, the greater is the volume of oil gas made, and the greater the stability of the gas; but, on the other hand, the less the illuminating power, and the greater the trouble in working, owing to the formation of soot and pitch. (2) Generally speaking, though, of course, only within certain limits, the denser or heavier the gas (or the greater the carbon ratio in the gas), the greater the illuminating power of that gas. (3) The heavy or easily condensable hydrocarbons play a most important part in the high illuminating power possessed by the heavy, but less stable, oil gases obtained by cracking oil at a low temperature. (4) Washing heavy oil gases with oil, and especially with petroleum oil, reduces the illuminating power of the oil gases so washed. (5) Heavy oil gases vary in luminosity from 50 to 75 candles—the latter power only having been obtained with comparatively small yields of comparatively unstable oil gas—when tested in suitable small burners *per se*; and when used as enrichers of coal gas, they show an increased illuminating power of from 10 to 20 per cent.

Now, these general ideas having impregnated the minds of gas engineers and chemists, Mr. Young—a man justly esteemed as occupying a unique position in all matters pertaining to mineral oils, and whose utterances consequently carry the greatest weight—startled us with a new process, in which (*a*) all the hydrocarbons easily condensable, or easily soluble in petroleum, are carefully removed from the gas, (*b*) a large proportion—about 30 per cent.—of the carbon in the oil is left in the retort, and consequently wasted as far as the oil gas is concerned, and (*c*) a large yield of oil gas is obtained per ton of oil cracked; and yet the oil gas produced is said to be far higher in illuminating power than, as far as my own knowledge goes, has ever before been attained with even an approximately stable oil gas. In view of these considerations, I think everyone is justified in suspending judgment till very definite proofs of these claims are brought forward. And, in my judgment, such definite proofs have not yet been *clearly* given in *published* statements on this process.

The only figure I can find of the illuminating value of the gas when burned by itself is one of 59 candles given by Mr. Ivison Macadam (see JOURNAL, Vol. LXI., p. 459); and even in this case it is not absolutely clear whether this applies to Young gas. In none of the enrichment tests given either by Mr. Bell, Mr. Linton, or Mr. Macadam is it clearly stated how the most important and crucial tests of the unenriched gas were carried out, and whether they really, and without shadow of doubt, represent the true average illuminating power of the whole bulk of gas enriched. Mr. Linton makes the intrinsic illuminating power (from enrichment) 100 candles, Mr. Macadam gives it as 96 candles, and Mr. Bell as 92 candles; while from the Musselburgh report, which I quoted from your correspondent (I unfortunately have not access to the report itself, but suppose I am safe in accepting your correspondent's note), the number works out at 63 candles. The ratio between Mr. Macadam's figure of 59 candles for burning *per se* and the higher enrichment figures just quoted is much greater, therefore, than the ratios hitherto found in practice. It has been stated generally in the papers on the Young process that the gas is permanent; but no definite tests of permanence of illuminating power have been published. Therefore, while in no way wishing to deny or disparage the high figures given, I can only

say that, to my mind, on the *published* data I cannot consider them as fully proven.

But, in my opinion, a comparison between the results which I have obtained at Huddersfield and those obtained with the Young process is absolutely outside the question at issue. *One of the main points I wished to determine was: Is the addition of oxygen to warm oil gas, when that oil gas is to be used for enrichment of coal gas, advantageous or not?* And to this, on the strength of my experiments, I unhesitatingly reply; "It is." At Huddersfield I was able at will to make oxy-oil gas or oil gas respectively by simply turning on or off the oxygen valve; and consequently I was able to use as closely identical or analogous oil and oxy-oil gases as could be well possible. As a result, and with practically identical percentages (2·96 and 3·02), the ratio of enrichment was 0·61 for oil gas and 0·89 for oxy-oil gas, or a gain of over 40 per cent. with the oxy-oil gas. These results confirmed my previous results on the small scale, and have further been substantially confirmed by Dr. Salomonson (the Dutch expert sent over to investigate the process), by Mr. Herring, and by Mr. Helps. They are diametrically opposed, I know, to those which Professor Lewes says he obtained two years ago. But I am prepared to stand by my own figures; and every opportunity will, I am sure, be given to Professor Lewes to repeat these tests at Huddersfield. This point being, in my opinion, fully established, I again say that if, as is possible, the Young oil-gas process is a far better one than that now in use for making oil gas at Huddersfield, then the addition of oxygen (or the application of the Tatham process) to the warm Young oil gas would give still more beneficial effects than I have observed with the less good oil process at Huddersfield.

Your reference to the oxygen being taken out in the purifiers, I can hardly read as anything but wilful misrepresentation. In my paper, I mentioned that, during all my experiments, enough oxygen was being added to the coal gas for all absorption in the purifiers. Mr. Herring mentioned in his remarks that 0·8 per cent. of oxygen was being so added; and I, in replying, again pointed this out. The question of the presence or absence of oxygen in the tested gas is clearly established by the conditions mentioned in my paper, and without the need for any analysis.

L. T. THORNE.

69, *Horseferry Road, Westminster, S.W., Dec.* 1, 1893.

[We are always pleased to hear from Dr. Thorne, even when he is angry. Of course, he was not bound to consult us either as to the form or the matter of his oxy-oil gas paper; but neither are we bound to be satisfied with anything or everything he may choose to publish. We are also within our right in selecting for notice in a technical paper, or the discussion upon it, whatever points may appear to us of supreme significance. Mention was merely made of the Young and Bell process as an example of what can be done by way of coal gas enrichment with oil gas *minus* oxygen; and if, after three years' experimenting at Huddersfield and elsewhere, the Tatham system of enrichment with oil gas *plus* oxygen can do no better, we fail to see that the latter has justified its existence. It will be soon enough to talk of what can be effected by a combination of Young and Bell oil gas with oxygen for the purpose of enrichment when the combination has been effected. Lastly, before an apologist for the Tatham process, as alleged to be successful at Huddersfield, ventures to ascribe misrepresentation to anybody, it would be well to remember that this is a term of reproach that cuts both ways. Dr. Thorne says that it was unnecessary to show by analysis the presence of free oxygen in the Huddersfield gas, as this was proved by his own and Mr. Herring's statements as to the proportion of oxygen admitted both as oxy-oil gas and for the purpose of absorption by the material in the purifiers. Would he be so good as to turn these proportions into actual quantities, and tell us where all the oxygen needed for these purposes is to come from? He states the capacity of the Brin oxygen plant at 30,000 cubic feet per day, which is no more than is wanted to make up 200,000 cubic feet of oxy-oil gas, without considering purification requirements. Is there misrepresentation here? If so, where?—ED. J.G.L.]

Mr. Alex. M'I. Cleland and The Gas Institute Index.

SIR,—I am the recipient of some few letters expressing surprise and resentment at the treatment accorded to the efforts of the Publications Committee of The Gas Institute by Mr. Alex. M'I. Cleland, in the course of his remarks on "Technical Indexing," which appeared in the JOURNAL a fortnight ago (see *ante*, p. 935). It occurred to me that the unusual lines adopted by our critic would carry their own condemnation, at any rate to those acquainted with Gas Institute matters; but my friends urge that others may be led to form erroneous views as to the way in which our operations are carried on, to the detriment of the Institute.

The index in question is a private work, prepared for the use of the members, in accordance with instructions from the Council. It is also important to notice that, although Mr. Cleland writes with marked assurance as to the expectations and the wishes of the members, not only assumes proprietary rights in connection with the works of the Institute, but also an intimate acquaintance with it, and gives extensive orders as to future proceedings, &c., he is not a member, and is indebted to the kindness of a friend, or to the courtesy of the Council in selling copies to outsiders, for the book that alternately raised his expectation and his wrath. I do not claim protection from criticism, but, on the contrary, would welcome suggestions as to the improvement of our work. If it had been issued to the public as a model index, or used for advertising the abilities of the Committee in any way, Mr. Cleland's remarks might be justifiable. But nothing of this sort has been done. Of course, a non-member cannot be expected to know the circumstances or instructions by which the compilers were guided; but Mr. Cleland has supplied this deficiency, possibly from his own imagination. This is bad enough, but he goes farther still. Not satisfied with saying in effect that the Publications Committee are both incompetent and negligent, he anticipates the possibility of their getting behind the printer, and politely (?) suggests that they are unable to properly appreciate the value of the various papers and presidential addresses. Such assumptions are more like abuse than criticism.

I gather that, apart from his quarrel with the title, he has three suggestions to offer. These are: More care in revision, improvements in arrangement, and a large extension of the whole. As to accuracy, everyone who has had any experience with indices knows that a few slips will occur with simple paging only, and that if Mr. Cleland had directed the search-light of his "forty-horse power microscope" style of reviewing upon any index embracing three distinct details to each item, he would have obtained similar grounds for his lordly disapprobation. Differences of opinion are sure to arise on the question of arrangement; but no serious error of judgment is entailed in placing "Tar Arresting" under "Condensation," in locating the one paper on sulphuric acid in its proper surroundings, or in refraining from labelling a special fuel gas for gas-engines as a water-gas process. This sort of thing could be carried on *ad infinitum*.

Although the methods adopted by our critic are not often used, except as a means of injuring an opponent, I willingly accept his assurance that he is not inspired by animosity; for it is quite possible that his procedure is simply the result of an ambitious desire to appear smart, or of over-cudgelling his brains in the task of spreading out his few points to the usual length of a "Communicated Article." The "nipping in the bud" process is required by many others besides novices at indexing. But, in any case, I would remind Mr. Cleland that it should be applied with care and judgment. No advantage is likely to follow if it is simply taken up as a means of showing how hard the operator can pinch.

THE CHAIRMAN OF THE PUBLICATIONS COMMITTEE
Nov. 28, 1893. OF THE GAS INSTITUTE.

The Effect on Volume of Adding Rich to Poor Gas.

SIR,—With reference to the remarks on the above subject made by Mr. J. C. Watson in the discussion on Dr. Thorne's paper read before the Southern District Association on the 23rd ult., the following observations may, perhaps, prove interesting to the former gentleman.

The phenomenon (if such a term may be applied to it) mentioned by Mr. Watson has also been observed by others. I have knowledge of at least one such instance, of which I will give a short description. A couple of 100-light wet meters were arranged side by side, with a vessel containing petroleum spirit (of what specific gravity is immaterial) between them. The error of registration in each meter being accurately ascertained, gas was then passed through No. 1 meter, through or over the spirit, and on to No. 2 meter. No loss took place at any of the connections; and yet when the corrected registrations were compared, it was found that they exactly agreed, although a considerable quantity of the spirit had disappeared.

Now, here was an experiment in which an increase of volume was confidently expected, owing to the care exercised, and the accuracy of the apparatus employed. But a little investigation proved that the spirit taken up by the gas had either been re-absorbed by the wet surfaces of the meter, or was of too small a quantity to be detected in the registration. At first, it was thought that the explanation lay in the difference between the specific gravities of the gas at the inlet of No. 1 meter and the outlet of No. 2, because, for example, 95 volumes of gas of ·458 sp. gr., added to 5 volumes at ·854 would produce 100 volumes having a specific gravity of ·4778, as shown by the following table:—

Vols.		Sp. Gr.		Product.
95	×	·458	=	43·51
5	×	·854	=	4·27
100	×	·4778	=	47·78

But, though the lighter gas would be decreased in volume, the heavier would gain as much as the lighter lost. For instance—

Vols.		Sp. Gr.		Vols.	Sp. Gr.
95	at	·458	=	91·063 }	at ·4778
5	,,	·854	=	8·937 }	
100				100·000	

So both Mr. Gandon and Mr. Watson, and likewise Dr. Thorne, may expect as many cubic feet of oil gas to be sold as are put into the holder and mixed with coal gas; the mixed gases being at a higher specific gravity than the coal gas.

When discussing this point with a colleague, mention was made of the familiar "parlour chemistry" experiment, in which the contents of a cup of hot tea, filled to the brim, do not overflow when four or five pieces of sugar are carefully added. This experiment, like Mr. Watson's, is interesting, but also crude and misleading. It might appear, at first sight, as if the added bulk of the sugar were balanced by the heavier gravity of the liquid. But a little consideration proves this to be fallacious. The actual solid bulk represented by half-a-dozen pieces of good crystallized sugar is really very small, and capillary depression permits of the tea rising an appreciable distance above the rim of the cup, especially if the latter is at all greasy; so that a slight addition to the contents cannot be detected. But if the tea be placed in a carefully graduated glass measure, the effect of the added sugar would soon be apparent. The increased volume would be noticed long before the point of saturation was reached.

Liverpool, Dec. 1, 1893. ALEX. M'I. CLELAND.

The Need for a Technical Index.

SIR,—May I be permitted, through the medium of the JOURNAL, to press, on behalf of a class of engineers who are perhaps the most to be commiserated, the urgent need of a copious and wide-embracing subject-matter index on things connected with gas manufacture. I mean the class of students—the younger members of the gas profession—who are continually being confronted with questions upon which they know

very little, and upon which they desire to know a great deal. How, I ask, are we to find out what has been written and said about any particular subject? Most of us, I imagine, fly at once to practically the only index in existence—viz., that of the JOURNAL. But, valuable as it is, this is debarred from being all that the increasing growth of technical literature demands, not only by its periodical publication, but by several other unavoidable drawbacks. If one or other of the many Gas Associations which exist would forthwith take this matter in hand, or if (say) half-a-dozen gentlemen would combine and issue a carefully compiled "Bibliography" of gas matters, a great benefit would be conferred on the gas profession at large, and more particularly on coming generations.

Nov. 30, 1893. C. E. BRACKENBURY, Stud. Inst. C.E.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1894) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

Aberdare Local Board Water.—The Aberdare Local Board intend to apply for authority to construct additional works, consisting of a reservoir, two roads, and three pipe-lines in the parish of Penderyn, in Brecon, and two other pipe-lines, partly in that parish and partly in Aberdare. For carrying out these works, and for the general purposes of the undertaking, application will be made for power to raise more money.

Abertillery Local Board (Gas and Water).—The Abertillery Local Board will apply for power to purchase the portion of the undertaking of the Brynmawr and Arbertillery Gas and Water Company lying within their district, in virtue of an agreement entered into between the parties on Oct. 5, 1893, in which the terms and conditions of the transfer were set forth. Provision will be made for the application of the purchase-money and the funds of the Company, and the reduction and re-organization of the capital and borrowing powers. Authority will be sought by the Local Board to carry on the undertaking, enlarge the water-works, supply gas or water in the ordinary way or in bulk, and raise more money. Separate accounts will be kept of the two undertakings; but it is proposed that the revenue of one should be taken to supplement that of the other when necessary.

Accrington Gas and Water Board.—The Corporation of Accrington give notice of their intention to apply to Parliament for authority to constitute a Gas and Water Board for the borough and the neighbouring districts, and to transfer to and vest therein the undertaking of the Accrington Gas and Water Works Company, which is to be acquired. The usual provisions with regard to the sale of gas and water within and beyond the limits of supply will be contained in the Bill to be promoted; and money powers will be sought. The Company will be wound up and dissolved.

Alloa Water.—The Alloa Police Commissioners purpose promoting a Bill to alter the Alloa Water Act of 1891, in so far as it relates to the level of water to be maintained in the Gartmorn Dam, and to enact that it shall not exceed a height of 168 ft. 3 in. above Ordnance datum. The Commissioners desire to be authorized to enter into, and carry out, agreements with any person in relation to the objects and purposes of the Bill, and to vary and extinguish all rights which would interfere with the objects of the intended Act.

Ambleside District Gas and Water.—The Ambleside District Gas and Water Company, Limited, desire to be dissolved and re-incorporated with additional capital powers, and with authority to maintain their existing and construct additional works, and sell gas and water in parts of the parishes of Windermere and Grasmere, in Westmoreland. In the Bill to be promoted with the above object, all the customary provisions in regard to the supply of gas and water will be included.

Bacup Corporation Water.—The Corporation of Bacup have notified their intention of applying for power to acquire the undertaking of the Rossendale Water Company, which is to be wound up, and to supply water in the district now served by the Company. The necessary money is to be raised by the creation and issue of Corporation stock.

Barnsley Corporation Water.—The Barnsley Corporation seek authority to extend their limits of water supply to a number of neighbouring townships and places, all in the West Riding of York, and to exercise therein the powers they possess in their present district as suppliers of water. One of the places included in the list is Penistone; and it is proposed to purchase the Local Board's water-works on such terms as may be agreed upon. Permission will be sought to enter into agreements with authorities, companies, and persons with respect to the supply of water to or by the Corporation; to purchase land and houses compulsorily, and carry out new works; and to raise more money.

Brent River (Cleansing and Purification).—Application is to be made to Parliament for authority to constitute a Board of Commissioners for cleansing and improving the River Brent and certain tributaries thereof; and it is proposed to give the Commissioners power to enter into agreements with various bodies—among others, the Thames Conservancy and the Grand Junction and West Middlesex Water Companies—for carrying out and maintaining any works to be constructed with the above object. The expenses are to be met by means of rates levied on the districts represented by the Commissioners.

Bury Corporation.—The Corporation of Bury give notice of their intention to apply for power to make new sewers and to carry out sewage works. The Bill to be promoted with this object will contain provisions enabling the Corporation to purchase compulsorily certain lands for the construction of an aqueduct or pipe-line authorized by the Bury Corporation Water-Works Act, 1889, and extending the time within which they are required under that Act to afford a supply of water to Haslingden. Additional capital will be needed.

Buxton Electric Lighting.—The Buxton Local Board wish for authority to construct the necessary works for producing, storing, and supplying electricity within their district, and to levy rates and charges in respect of such supply. They also seek power to raise money for the above purpose, and to enter into contracts for the transfer to companies or persons of any rights acquired in regard to the undertaking.

Cardiff Corporation.—In a General Bill of which notice has been given by the Cardiff Corporation, power will be sought to enable them to enlarge a reservoir authorized by their Act of 1884 and carry out other works in connection with their water undertaking. These comprise the diversion of two roads and the construction of a pipe-line. Provisions will be included in regard to impounding water, and the supply of water to occupied houses, closets, urinals, &c.; also with reference to the application of corporate funds, the establishment of a thrift-fund for the officers and servants of the Corporation, and the extension of borrowing powers.

Carshalton Gas.—The Carshalton Gas Company intend to apply for authority to amalgamate with the Croydon Commercial Gas Company, and transfer their undertaking to that Company. The necessary powers will be sought for the conversion and consolidation of the capital, the regulation of dividends, the variation of the rates and charges of the Carshalton Company, and the granting of compensation to the Directors and officers.

Chesterfield Water and Gas.—The Chesterfield Water-Works and Gas Company intend to apply for power to construct an additional reservoir and other works, and extend their limits of supply so as to include the townships of Calow and Temple Normanton. Authority will be sought to alter the rates and charges the Company may now make, and to confer, vary, and extinguish exemptions from such rates and charges. Further capital will be required.

Colne Valley and Central Middlesex Water Companies.—Application is to be made by the Colne Valley Water Company for power to acquire certain portions of the undertaking of the Central Middlesex Water Company, Limited, who are assigns of the undertakers named in the Alperton and Sudbury Water Order, 1884. The portions of the works to be transferred are situated in the parishes of Harrow-on-the-Hill and Northolt, and they comprise a reservoir and piece of land on Wembley Hill; and with them will be acquired all the rights and privileges appertaining thereto. The Bill to be promoted will authorize the Central Middlesex Water Company, and the Colne Valley, the Grand Junction, and the Rickmansworth and Uxbridge Valley Water Companies, or any one or more of them, to enter into contracts for the acquisition of the parts of the undertaking of the first-named Company which may not have been transferred. Provision will be made for necessary amendment of Acts.

Consett Water.—The Consett Water Company are desirous of constructing new works, comprising three reservoirs—one on the Eudon Burn, another on the Feldon Burn, and the third on the Hisehope Burn—a service-tank in the township of Tanfield, and various conduits or pipe-lines; and they have notified their intention of applying for the necessary authority for these purposes, as well as for an enlargement of their existing powers and an extension of their limits. The rights of the Newcastle and Gateshead Water Company to supply water in certain townships into which the Consett Company desire to extend their operations are to be extinguished; and, on the other hand, the latter Company will relinquish to the Weardale and Shildon District Water Company the right to supply Holmside and Esh, in the parish of Lanchester, and Plawsworth, in Chester-le-Street. An increase of capital will, of course, be applied for.

Driffield Gas.—The Driffield Gas Company desire to be dissolved and re-incorporated with power to manufacture and sell gas in Great Driffield and the neighbouring townships, maintain and extend their works, supply gas stoves, fittings, &c., and levy rates and charges. Additional capital will be applied for.

Dundee Corporation.—In a General Bill, of which notice has been given by the Dundee Corporation, for the constitution of the city and burgh as a county of a city, provisions are included in regard to the gas and water undertakings. The portions of the Dundee Gas Act, 1868, under which the existing Gas Commissioners were appointed, are to be repealed, and the Corporation are to be the Commissioners for gas purposes. Authority is to be sought for transacting the business of the Water Commissioners at meetings of the Corporation and its Committees. Fresh powers will be applied for with respect to both gas and water debenture stock, and the raising of more money; also as to making provision for the resignation of officials.

East London Water.—The projects embodied in the Bill of which the East London Water Company have given notice were dealt with in the article on "Water and Sanitary Affairs" in the last number of the JOURNAL. They comprise the construction of additional storeage reservoirs at Tottenham, Walthamstow, and Hackney, with the necessary conduits or pipe-lines; the confirmation of the terms of an arrangement made by the Company as to Lammas or commonable rights over certain lands in the parish of Leyton, and of the works carried out by the Company thereon; and the raising of further capital, to the amount of £500,000, by debenture stock, with special provisions as to its application.

Edinburgh and Leith Corporations Gas.—The Gas Commissioners of the Edinburgh and Leith Corporations intend to apply for power to carry out the extension of their Leith works, of which particulars were given in the report submitted to them by the Engineer of those works (Mr. F. T. C. Linton), and published in the JOURNAL for the 14th ult. Authority to raise additional capital will be sought.

Falkirk and District Gas.—The Falkirk Joint-Stock Gas Company, Limited, are desirous of being dissolved and re-incorporated, with power to maintain and extend their existing works, and to construct additional works, on land at present in their possession, as well as on a site to be acquired by compulsion or agreement. In the Bill to be promoted for carrying out these objects, authority will be sought to break up streets for laying mains, sell gas in bulk, deal in residual products, acquire patent rights, manufacture and sell or let on hire, gas meters, fittings, &c., levy rates and charges, and raise further capital.

Falkirk Corporation Gas.—The Burgh Commissioners of Falkirk notify their intention of applying for power to construct works for the production, storeage, and supply of gas, and for the manufacture of residuals; to sell gas within the burgh of Falkirk and the adjacent parishes and places; and to purchase, by compulsion or agreement, the undertaking of the Falkirk Joint-Stock Gas Company, Limited, and carry it on, extend the works, and erect new ones. The Bill will provide for the sale of the undertaking by the Company, and their subsequent dissolution and winding up. The limits of supply are to be defined and extended. Power will be sought to levy and alter rents, rates, and charges, and generally carry on the business of suppliers of gas. Additional money powers will be asked for.

Fulwood Local Board.—The Fulwood Local Board wish to be authorized to construct a reservoir, to be situated in the township of Goosnargh-with-Newsham, in Lancashire, and a pipe-line connecting it with the existing Barnsfold reservoir. Power will be asked to stop up a water-course, divert waters, acquire lands, and borrow more money.

Gloucester Corporation.—Application is to be made by the Gloucester Corporation for authority to construct new water-works, comprising a well and pumping-station, a reservoir, two tunnels, two pipe-lines, and the diversion of two roads. Among the provisions of a General Bill to be promoted by them for carrying out the foregoing and other objects, is one to amend a Local Act (4 Wm. IV., cap. 44), which provides for the lighting of the suburbs of Gloucester with gas, so as to extend the limits therein defined to a distance not exceeding two miles from the boundary of the city. Additional money will be required.

Grand Canal Company.—In a Bill to be promoted by the Grand Canal Company (Dublin) to enable them to acquire the undertaking of the Barrow Navigation Company, provision will be made for the granting by the purchasing Company of water supplies, and for the storeage and sale of surplus water; also for the prevention of the pollution of such water as is intended to be used for domestic purposes.

Grimsby Extension and Improvement.—In a General Act to be applied for by the Grimsby Corporation, authority will be sought to purchase the undertaking of the Great Grimsby Water-Works Company, Limited, with all the powers and privileges appertaining thereto. Provisions will be included for applying existing funds, as well as others which may be sanctioned, to the carrying out of this and the other objects the Corporation have in view.

Harrow and Stanmore Gas.—The Harrow District Gas Company will apply for power to acquire the works and property of the Great Stanmore Gas Company, Limited, and to carry on the combined undertaking. The absorbed Company will, of course, be wound up and dissolved. The limits of supply are to be extended so as to include Harrow Perivale, Northolt, Great Stanmore, Little Stanmore, Pinner, Edgware, Hendon, and Kingsbury, in Middlesex, and Bushey and Aldenham, in Hertfordshire. The Company will seek power to deal in stoves, fittings, &c.; to sell gas in bulk; and to alter and increase their capital.

Hebden Bridge Gas.—The Hebden Bridge Gas Company desire authority to purchase additional lands, erect new works, manufacture and deal in stoves and other appliances, and make provision in regard to the pressure and quality of their gas and the testing thereof. It is desired to alter the provisions of the existing Act, so that the principle of the sliding-scale may be introduced; and more capital will be applied for.

Kendal Corporation Gas and Water.—As already stated in the JOURNAL, the Kendal Corporation have arranged to acquire the undertaking of the Kendal Union Gas and Water Company; and they have accordingly given notice of their intention to promote a Bill to enable them to carry out their project. A new reservoir, to be called the Fisher Tarn reservoir, is to be constructed, with the necessary conduits or pipe-lines and other works. All the powers usually granted to suppliers of gas and water will be sought, as well as authority to raise money on loan.

London County Council (General Powers).—In a General Bill of which notice has been given by the London County Council, provision will be made for the lighting of staircases and passages in buildings designed for use in flats or tenements, where such staircases and passages are used in common by occupants of different flats and tenements, and are open at night; and for imposing upon the owners of any such buildings, or any other persons who may be defined, the obligation to light and keep lighted such passages and staircases between certain hours, under pain of incurring a penalty.

London County Council (Water).—The London County Council, as already stated in the JOURNAL (see *ante*, pp. 929, 942), intend to promote a Bill to enable them to purchase lands, water-works and rights, and supply water for public or private purposes within the Administrative County of London and the neighbourhood. The London Water Act, 1892, is to be amended, and its provisions extended.

Millom Local Board.—The Millom Local Board are desirous of being empowered to construct additional water-works, consisting of a dam on the Stoupdale Beck and a pipe-line connecting it with the existing storeage reservoir, and the works incidental thereto; and to impound the waters of certain streams or rivers. They also wish to enlarge and improve their gas-works, and extend their limits of supply in regard to both gas and water. It is proposed to amend the Millom Gas and Water Act, 1875, with respect to the sinking fund, borrowing powers, and other matters, and to make further provision as to sinking funds. Application will be made for an extension of the period specified for the repayment of existing loans.

Neath Corporation Water.—The Neath Corporation intend to apply for power to purchase the undertaking of the Neath Water Company, carry it on, and construct additional works. The Company will be wound up and dissolved. It is proposed to make provision for the sale of certain portions of the undertaking to Local Authorities outside the borough; and also for the supply of water in bulk. The construction of the reservoir authorized by the Neath Water-Works Act, 1885, is to be relinquished; and the deposit fund impounded in respect thereof is to be transferred to the Corporation. More money will be required.

Newcastle and Gateshead Water.—Authority will be asked by the Newcastle and Gateshead Water Company to abandon the construction of the Cat Cleugh reservoir, sanctioned by the Company's Act of 1889, and certain works connected therewith, and construct other works. These comprise a reservoir in the townships of Rochester and Troughend, new conduits or pipe-lines, and deviations of the one already authorized, all in Northumberland; and several pipe-lines in Durham. Power will be sought to acquire the necessary lands, &c., compulsorily or by agreement; to make arrangements with land, mill, and mine owners; and to lay down regulations for the prevention of waste and the contamination of water. Additional capital will be needed.

Paignton Gas.—The Paignton Gas Company desire to be dissolved and reincorporated, with power to supply gas in the parishes of Paignton, Marldon, Churston Ferrers, and Stoke Gabriel, all in Devonshire, and to maintain and continue their existing works, and construct new ones on lands to be acquired. Authority is to be sought to manufacture gas and residual products, make and supply meters, fittings, stoves, &c., sell gas in bulk, and levy rates and charges. The Act to be applied for will contain provisions for protecting the Company's works, preventing the waste and misuse of gas, defining and regulating its supply, and other purposes. Powers with regard to the existing, and authority to raise additional capital, will be applied for.

Plymouth and Stonehouse Gas.—The Plymouth and Stonehouse Gas Company intend to apply for authority to manufacture, purchase, or hire, and sell or let on hire, and contract for work in connection with, gas engines, stoves, meters, fittings, and apparatus; also to provide and supply electricity, electric energy, or any other description of light or illuminating power, within their existing limits, and levy charges therefor. Additional capital will be needed; and permission will be sought for the conversion and consolidation of the existing shares.

Pontypridd Water Company.—The Pontypridd Water Company are desirous of constructing a tramroad for the conveyance of mineral, stone, and merchandise; and they will apply for the necessary power to purchase land, levy tolls and charges, &c.

Preston Gas.—The Preston Gas Company intend to apply for power to extend their limits of supply, so as to include the townships of Brindle and Grimsargh-with-Brockholes, and also to acquire land and construct gas and other works. The Bill to be promoted for the above-named purposes will contain provisions as to the supply of gas, meters, fittings, &c.; the illuminating power of the gas; the supply of electric light; and increase of capital.

Southend Water-Works.—The Southend Water Company propose to apply for power to extend their limits of supply, and construct new works, comprising four pumping-stations and a similar number of pipe-lines, with the necessary incidental works; and for these purposes additional capital will be needed.

South Hants Water.—The South Hants Water Company propose applying for an extension of their limits of supply, so as to include several parishes in the county of Southampton, and for authority to purchase any water-works now existing in those places. The Company's works are to be extended; and additional capital and other powers will be sought.

Southwark and Vauxhall Water.—The scheme for the construction of new reservoirs, and the carrying out of other works, of which full particulars are given by the Southwark and Vauxhall Water Company in the notice of their intended application to Parliament, was dealt with in our article on "Water and Sanitary Affairs" last week. The works comprise three reservoirs and two double pipe-lines, with the incidental channels, adits, wells, filter-beds, machinery, &c. Power will be sought to connect the various portions of the Company's works, and to acquire by agreement lands and easements therefor, and to take an additional quantity of water from the River Thames. Further capital, both share and loan, will be applied for; and special provisions will be framed as to the manner of raising it.

Swindon Water.—The Local Boards of Old and New Swindon intend to promote a Bill to confirm an agreement entered into by them for the purchase of the property of the Swindon Water-Works Company, Limited, whose affairs are, of course, to be wound up. The two Boards are to be incorporated, and a Committee is to be appointed to carry on the undertaking; and all the necessary powers to enable them to do so will be sought. The limits of supply are not to be confined to the Boards' districts, but to include adjacent places. An additional reservoir is to be constructed in the parish of Wroughton, together with subsidiary works. Authority will be asked to raise money for the above-named purposes.

Swinton Local Board.—The Swinton Local Board desire power to acquire lands and construct certain works, comprising two storeage reservoirs (one to hold 500,000, and the other 50,000 gallons of water) a well and pumping-station, and three lines of pipes. The Bill to be promoted by the Board will contain provisions for the raising of more money, and the extension of the terms and conditions attaching to that which has been already borrowed, and the sinking funds in respect thereof; and also as to levying rates and charges for water, and its sale by agreement outside the area of supply.

Thames Conservancy.—The notice of the intended application by the Thames Conservancy Board for leave to promote a Bill for the consolidation, repeal, extension, and amendment of existing Acts relating to them, has been already dealt with in the JOURNAL (see *ante*, pp. 930, 999). The Bill will include provisions for altering the constitution of the Board, extending their jurisdiction with regard to the prevention of the pollution of the river and its tributaries, compelling County Councils, Water Companies, and other bodies to contribute to their funds, and other matters.

Torquay Gas.—The Torquay Gas Company wish to be empowered to acquire land and construct new works for the manufacture of gas and the treatment of residual products. Further provision will be made in regard to the supply of gas in the ordinary way as well as in bulk; and additional capital will be asked for.

Torquay Water and Improvement.—The Corporation of Torquay give notice of their intention to promote a Bill for various purposes connected with the government of the town. It will include some

provisions for protecting the source of water supply, and preventing its pollution; and also for constituting the water-works, and the other works, lands, and things proposed to be authorized and taken by the intended Act, part of the water undertaking of the Corporation. The water rents, rates, and charges are to be altered; and provisions will be made as to assessments, the raising and application of moneys, &c. It is proposed that the powers granted by the Torquay Electric Lighting Order of 1891 for the construction of works and the supply of electricity within the borough shall be revived, and the time fixed for the completion of the works extended.

West Middlesex Water-Works.—An application is to be made by the West Middlesex Water-Works Company for authority to raise additional capital for the general purposes of their undertaking, by the creation and issue of new shares or stock, either preference or ordinary, or by borrowing on mortgage or debentures. Permission will be sought to amend section 11 of the Company's Act of 1806 with reference to the dates for holding general assemblies of the shareholders. It is proposed to incorporate and make applicable to the Company, and to their present and future capital, certain sections of the Companies' Clauses Consolidation Act, 1845; and the Company's various Acts are to be amended so far as may be necessary.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE FOR PROVISIONAL ORDERS (SESSION 1894).

Under the Gas and Water Works Facilities Act, 1870.

Bishop's Waltham Water.—Application is to be made by a Company to be formed under the title of the Bishop's Waltham Water-Works Company, Limited, for authority to maintain and continue the water-works which have been constructed and are now in operation in that town, and to supply water within certain limits to be defined. The amount of capital is to be specified; and power will be asked to increase it, and also to levy rates and charges.

Blandford Water.—The Blandford Water Company purpose asking for power to construct additional works, comprising a well and pumping-station, two conduits or pipe-lines, and a reservoir, and to supply water in Blandford Forum and other places in Dorset. For these and the general purposes of the undertaking, additional capital will be needed.

Bolsover Gas.—The Bolsover Gas Company intend to apply for power to maintain and continue their existing works, construct new works, manufacture and store gas and residual products, and supply the former within the parish of Bolsover, or sell it in bulk to any local authority or gas company authorized to supply it. The usual permission to break up roads, levy rates and charges, &c., will be applied for, as well as additional capital.

Broadstairs Gas.—The Broadstairs Gas Company wish to be authorized to use a certain piece of land, situate at Broadstairs, for the erection of a gasholder and the carrying out of other works for the storeage of gas and coke.

Earby and Thornton Gas.—The Earby and Thornton Gas and Lighting Company, Limited, wish for power to acquire and continue the existing gas-works of the Mill Company, Limited, and others connected therewith, and to construct new works for the manufacture and supply of gas in the parish of Thornton-in-Craven, in the West Riding of York—including Thornton, Earby, Kelbrook, and Harden. The rights and privileges usually conferred upon suppliers of gas will be applied for. The amount of the Company's capital is to be fixed and defined in the Order.

East Surrey Water.—Application is intended to be made by the East Surrey Water Company for power to raise additional share and loan capital, and to purchase lands, buildings, and property, and hold or dispose thereof.

Ilford Gas.—Power will be applied for by the Ilford Gas Company to use lands already in their possession for the manufacture and storeage of gas, to purchase more land, and to extend their works. The Company wish to be authorized to acquire and hold patent rights in relation to the production and distribution of artificial light, and the utilization of the residual products of gas manufacture; and also to manufacture, deal in, or let on hire, gas stoves, engines, fittings, and other apparatus, and to supply gas in bulk. Additional capital powers will be sought.

New Quay Gas.—The New Quay Gas Company, Limited, intend to apply for authority to maintain and continue their existing works, and construct new ones, for the manufacture and supply of gas in the parish of St. Columb Minor, in Cornwall. Power to raise additional capital will be applied for.

Steyning Water.—Application is to be made, by certain parties who are not named, for authority to construct works and supply water to the town and parish of Steyning, in Sussex. The works consist of an aqueduct or pipe-line, commencing at a junction with the main of the Shoreham and District Water Company in the high road from Steyning to Shoreham, and terminating at the western end of the High Street of the former town; together with the necessary incidental works. Power will be sought to enter into an agreement with the Shoreham Company for a supply of water in bulk to the undertakers, and for the latter to sell it to other bodies or persons within the limits of the Order, and to levy rates and charges therefor.

Tilehurst, Pangbourne, and District Water.—Application is to be made by certain parties, who are not specifically defined in the notice, for authority to construct and maintain water-works, and supply water to Tilehurst, Pangbourne, Theale, Tidmarsh, Sulham, Purley, Whitchurch, and Englefield, in Berkshire. Special provisions are to be made for the protection of the undertakers' works, and their sale or lease. The usual powers granted to suppliers of water will be sought.

Uttoxeter Gas.—The Uttoxeter Gas Company desire authority to maintain and extend their works for the manufacture of gas and residual products, supply gas in the parish of Uttoxeter, and levy rates and charges in respect of such supply. The necessary powers to break up roads, streets, &c., supply meters, fittings, and stoves, and sell gas in bulk, will be sought; as well as further money powers.

West Cheshire Water.—The West Cheshire Water Company intend to apply for power to extend their limits of supply, so as to include a number of townships in the parishes of Shotwick, Stoke, Ince, and Thornton-le-Moors, all in the county of Chester; also to sell water in bulk, and raise additional capital,

Willenhall Gas.—The Willenhall Gas Company notify their intention of applying for power to raise additional capital.

Worthing Gas.—The Worthing Gas Company are desirous of being empowered to acquire lands, construct works, and manufacture and supply gas, fittings, &c.; to make provisions in regard to insurance and reserve funds; to adopt a sliding scale of price and dividend; and to raise additional capital.

Under the Electric Lighting Acts, 1882 and 1888.

Applications will be made under the above Acts for powers in regard to the supply of electricity for lighting and other purposes in the following places: Aberdare, Barrow-in-Furness, Bedford, Birmingham, Bournemouth, Camberwell, Chelmsford, Chepping Wycombe, Chesterfield, Crystal Palace and District, Grimsby, Guildford, Hamilton, Harrow, Leyton, Monmouth, Moss Side (Collier Marr Company), Oswestry, Penrith, Peterborough, Plymouth, Shrewsbury, Stirling, St. Austell, St. Helens, Swansea, Wakefield, West Hartlepool, and Yeadon.

NOTICE OF AN APPLICATION TO THE LOCAL GOVERNMENT BOARD UNDER THE PUBLIC HEALTH ACT, 1875.

Wokingham Corporation Gas.—The Wokingham Corporation purpose making application for authority to maintain and continue their existing gas-works, and manufacture and supply gas within the borough. The usual powers granted to suppliers of gas will be sought.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE.—Queen's Bench Division.

Monday, Nov. 27.

(*Before Mr. Justice* KENNEDY.)

Sugg and Co., Limited v. Lord A. Hill and others—Gas Engineering Work at the Irish Exhibition.

This was an action brought by Messrs. W. Sugg and Co., Limited, against Lord Arthur Hill, Secretary, Mr. Justin M'Carthy, M.P., Mr. Herbert Gladstone, M.P., Mr. J. H. Rafferty, and the Earl of Leitrim, members of the Executive Council of the Irish Exhibition held in London in 1888, to recover £635 11s., the balance of an account for work in connection with the exhibition. The defendants pleaded that the work was not done upon their order; that after a certain date it was done upon the credit of a Company; and, finally, that the plaintiffs, by presenting in Chancery a petition for the winding-up of that Company, had elected to treat them as their debtors, and could not recover against the defendants.

Mr. HARRIS, Q.C., and Mr. MORTON DANIEL appeared for the plaintiffs; Mr. FINLAY, Q.C., Mr. M'CALL, Q.C., and Mr. MUIR MACKENZIE represented the defendants.

Mr. HARRIS said that the exhibition was opened in 1888, at Olympia, for benevolent purposes, and turned out to be an utter failure. The plaintiffs were engaged to do the gas engineering; and altogether work to the value of £1242 10s. was performed. On the 23rd of June, 1888, the Executive Council registered themselves as a Company; and, being a benevolent institution, they were not required to insert the word "Limited," which would have given notice to tradesmen and others that there had been a change. On the 24th of September, it was discovered by the plaintiffs' agent that they had registered the undertaking as a Company; and they were ultimately asked by the Solicitor of the defendants to supply them with the details of the work done before the 23rd of June and afterwards. On the 28th of August, the plaintiffs sent in their claim, but failed to get their money; and on the 10th of November, they presented a petition for winding up the Company. It then appeared that, some time before, the Exhibition Company had sold all their assets and debts to the Agricultural Hall Company, so that they had no property.

Mr. FINLAY said it would perhaps save time if he explained that two points were taken on behalf of the defendants. Out of the total amount incurred for work done, some £600 had been paid; and the defendants said that the whole of this sum must be placed against the earlier items of account in order of time. The plaintiffs, however, credited three cheques—one drawn on the 22nd of June, and passed through the bank later, and others drawn subsequently—against work done after the 23rd of June. If this contention of the defendants were upheld, this would make £300 difference in regard to the amount recoverable. Then the defendants said the plaintiffs, with full knowledge of the facts, petitioned as creditors against the Company, and elected to hold them responsible. His learned friend was mistaken in saying the Company had no assets, as a considerable amount had been got in by the Liquidator.

Evidence having been taken as to the facts, the further hearing was adjourned till Wednesday, when it closed; judgment being reserved.

Thursday, Nov. 30.

His LORDSHIP gave judgment this morning for the plaintiffs for the full amount claimed, with costs. He held that the plaintiffs, in presenting a petition to wind up the Company on Nov. 12, 1888, had not "elected" to look to the Company, and not the individual members of the Executive Committee, as their debtors; that the plaintiffs never meant to abandon their remedy against men of wealth, honour, and social position, for an insolvent Company; and that there was no "novation" by the new Company incorporated on June 23, 1888, taking over liabilities of persons who previously existed, and no

acceptance of such new responsible body by the plaintiffs, as creditors, whose assent was necessary to make the transaction binding in law.

On the application of Mr. Muir Mackenzie, his LORDSHIP granted a stay of execution for ten days. If notice of appeal were given, the defendants would be entitled to a further stay.

STAFFORDSHIRE QUARTER SESSIONS.—Tuesday, Nov. 28.

(*Before Mr.* T. F. TWEMLOW, *Chairman; Lord* HATHERTON, *and Messrs.* H. T. HINCKES *and* F. JAMES.)

The Rating of the Bilston Gas Company's Property.

A special sitting of the Court was held to-day to hear an appeal by the Bilston Gas Company against a poor-rate assessment made on them by the Assessment Committee of the Dudley Union.

Mr. HUGO YOUNG and Mr. KETTLE appeared for the appellants; Mr. ALFRED YOUNG and Mr. PLUMPTREE for the respondents.

Mr. HUGO YOUNG, in opening the case, stated that his clients appealed against a poor-rate for the parish of Coseley, which was made on May 10 last, upon a rateable value of £630 (gross £756). A new assessment was made in 1883, when the rateable value was put at £291; so that the Company were now appealing against an increase in their assessment of as much as £339, or 130 per cent.

Mr. JAMES: At once or at different times?

Mr. HUGO YOUNG replied that there had been no new assessment from 1883 to 1893. He contrasted the profits of the Company in 1883 with the profits in 1892, and said there was no corresponding rise in the profits between the two poriods to account for the increase in the rateable value. The profits in 1883 were £4653; and the profits in 1892, £4853—showing a rise of £200. He also compared the revenue for the two periods, which was £11,046 in 1883, and £13,507 in 1892—a rise of £2461. It would lie, he said, on the respondents to show some very good reason why there had been so large an increase in the assessment. The works were carried on under an Act of 1846, which provided for the supply of gas to Bilston and various other villages. They had now nothing to do with the Bilston part of the undertaking; but with the Coseley or Lower Sedgeley part of the hereditament. All the non-productive part of the concern was in the Bilston district. The capital which was authorized by the Act was £35,000, in £5 shares; and this was all issued. By the Company's Order of 1883, power was given to raise, by ordinary and preference shares, an additional sum of £32,000. But the whole of this power had not been exercised; and the present capital, besides the £35,000 ordinary shares, was £19,000 "B" shares. By the Order of 1883, certain limits were imposed on the Company; and these were that they should only pay 10 per cent. on the original capital, 7 per cent. on the additional ordinary stock, and 6 per cent. on the preference stock. The £19,000 was at 7 per cent. The price of gas was fixed by sliding-scale, with 3s. 6d. as the standard. Proceeding to deal with the figures, Counsel showed, from the appellants' point of view, how the valuation for rating purposes should be made up. The receipts of the Company for 1892 amounted to £18,147; and the expenditure to £10,943. Having £7204 as the net profit, they had to ascertain what was the working capital, for the purpose of arriving at the tenant's share, and dividing the net receipts between landlord and tenant. The working expenses they put at £10,943; and adding another item of £1379 for repairs, gave a total of £12,322, which a tenant beginning the business would have to find as the work went on from month to month. For their purpose they had to look at a tenant starting in 1892, and not being entitled to the gas-rental of a preceding period. The accounts being paid quarterly, he would receive very little for the first four months of his tenancy. During that time, too, he would have to expend money for coal, wages, &c., and on repairs; and these made up the item of £1379. In dealing with the tenant's capital, the tenant would have to be prepared with a third of the total year's expenditure for repairs. Then there was coal; and a prudent tenant, having regard to his knowledge of coal strikes, would always keep in hand a stock equal to at least eight weeks of the maximum total consumption. For this he would require to have at least 3053 tons of coal; and at 13s. a ton, this would amount to £1984. In addition, there were sundry stores, £234; meters and stoves on hire, £697; and a quarter's rental, which the tenant would have to find, because he would not have received any gas-rental, £1252. They had taken the usual allowances to the tenant as follows: Interest on capital at 17½ per cent.; trade profits, 5 per cent.; risks and casualties, 10 per cent. —total amount, £2194. These sums deducted from the net receipts left £5010 to be carried forward as the gross estimated rental of the whole undertaking. From the £5010, they had to take all the statutory deductions, repairs, maintenance, and renewals; and these were estimated at the rate of 3½d. per 1000 cubic feet of gas sold. Last year the total consumption was 94,557,000 cubic feet; giving an item of £1379 to be properly deductable for repairs. Renewals were taken at 3 per cent., which worked out at £1097, or 2¾d. per 1000 cubic feet of gas made.

Mr. JAMES: What term do you take for the life of the buildings?

Mr. YOUNG replied that thirty years was the average usually taken. He then proceeded to detail the various other deductions claimed by his clients, and contended that the proper rateable value of the undertaking in the Coseley parish was £314. They had taken all the rates at 5s. 9d. in the pound; therefore it was necessary to make an adjustment, because the rates in Bilston were 6s., and in Coseley 4s. 2d. They had to take £20 of the Bilston rateable value, and add it to Coseley; raising the total rateable value from £294 to £314, and reducing that of Bilston from £2184 to £2164. The gross gas-rental at Coseley at the end of 1892 was £3959. No doubt this was to some extent an increase as compared with 1883, when the last valuation was made; but, on a true valuation of the Company's property, there was nothing in the slight increase in the gas-rental of Coseley which justified putting up the assessment by as much as 130 per cent.

Mr. *T. Hudson*, Borough Accountant of West Bromwich, stated that he had made a valuation of the gas undertaking. Coseley was a mining district, and was thoroughly undermined; so that the cost of maintenance and repairs was a continuous item. The yearly profits for the last ten years had averaged £4668, and had not varied more than £15 in the ten years. He fixed the rateable value at £314.

In cross-examination, witness said he did not know that the receipts from Coseley in 1892 were more than double what they were in 1883, or that the extensions of mains in that period had been very slight.

Re-examined: There was no part of the works totally unoccupied.

Wednesday, Nov. 29.

On the resumption of the proceedings this morning,

Mr. *T. Newbigging* was first called. He stated that he had examined the accounts of the Company for the year ending Sept. 30, 1892, and found that the total receipts were £18,147, and the expenditure £10,943. A tenant entering on the undertaking in October would have to expend £19,084 in laying in an adequate stock of coal, and £2451 in coal carbonized, before he received anything in return—in fact, a tenant would have to find four months' capital, because there would be no revenue accruing during that period. Witness was examined at length as to the details.

In cross-examination as to the life of the various works, it was pointed out to witness that there were certain discrepancies in his valuation under this head and a book, on the assessment of gas-works, which he published in 1891. He admitted that he had made no provision for the scrap value of the plant and buildings in cases of renewals, and said he put down certain lump sums as the value, but had no figures of details showing how the lump sum was arrived at. He also admitted that he had put down the insurance at 7s. 6d. per cent., and was not aware that the actual figure should have been 3s. 6d. per cent.

Mr. *J. S. Reeves*, Secretary and Manager of the Company, stated that no sums paid as deposits were included in the prepayment account, and that they took no stock of fire-bricks, oxide of iron, or other loose material, which was always on hand at about the same quantity.

This concluded the case for the appellants; and the Court retired to consider the matter as it stood. On returning,

The CHAIRMAN said that the Court had carefully considered the case as it stood; and they thought there was so great a discrepancy in the figures as presented that a considerable rise must take place. They were not prepared, however, to affirm the figure of £630 as one that should be the rateable value. Having thus indicated their feeling in the matter, possibly the parties would agree if the case stood further adjourned.

Mr. HUGO YOUNG asked, if this course was adopted, that a copy of the respondent's valuation should be handed to them, so that they could compare it with their own, and possibly they could then agree upon a figure which the Court could accept.

Mr. A. YOUNG said he was perfectly prepared to discuss the matter, and promised that the appellants should have a copy of his clients' valuation sent to them at least seven days before the next hearing, if they did not settle.

The CHAIRMAN suggested that it would facilitate matters if the figures were handed over at once.

Ultimately this was agreed to; and the case was adjourned formally until Dec. 8, with the understanding that it would be further adjourned until Dec. 18 if not settled.

The Employers' Liability Bill.—Among the petitions presented to the House of Lords for the amendment of the Employers' Liability Bill is one by workmen of the South Metropolitan Gas Company.

Extension of Purifying Plant at Luton.—The Whessoe Foundry Company, Limited, of Darlington, have just completed some large extensions in purifying plant (four 25 feet square purifiers, with centre-valve, lifting apparatus, &c.) to the designs of Mr. W. Phillips, Engineer and Secretary of the Luton Gas Company, for his works.

New Joint-Stock Companies.—The Gas Traction Company, Limited, has been registered with a capital of £100,000, in £1 shares, to adopt and carry into effect an agreement, expressed to be made between P. Holyoake and others of the one part and the Company of the other part, "for the acquisition of certain patents and inventions relating to the traction and propulsion of vehicles by means of gas," and to develop and turn them to account. Among the first signatories to the Memorandum of Association is Mr. J. Fletcher Moulton, Q.C. A Company has been formed, with a capital of £100,000, in £100 shares, to acquire the business hitherto carried on by Messrs. J. Defries and Sons, as gas and electrical engineers, &c., at 147, Houndsditch, and elsewhere.

The Price of Gas in the Chartered Company's District.—Last Tuesday evening, the first of a course of public meetings was held at the rooms of the Central Finsbury United Liberal and Radical Association, St. John Street Road, and Mr. J. Rowlands, M.P., delivered an address on "The Unjust Price of Gas and the Remedies." He referred to the discontent of a number of gas consumers in St. Luke's, who could not see why they should pay 3s. 1d. per 1000 cubic feet while in the South of London the price was only 2s. 6d. They called a meeting, which was very numerously attended; and they were prepared to carry on the agitation till they obtained something like justice from The Gaslight and Coke Company. He referred to the correspondence which had passed between himself and the Secretary and General Manager of the Company (see *ante*, p. 136); and in doing so he challenged the validity of the arguments used by that gentleman as to the causes of the price charged. He hoped the result of the meeting would be a very powerful organization that could go to the Company backed by an influence which they could not resist. He could not see why the North of London should have to pay for gas a charge so much higher than was paid in the South. A suggestion was made by a consumer that the Gas Companies should be bought out by the Municipality. Mr. Rowlands, while agreeing with the principle, said this was not the time to buy. The electric light would soon become more used; and then the Companies would be at a discount. Mr. H. Munday moved—"That this meeting pledges itself to use its best endeavours to support the Gas Consumers' Protection League in their efforts to remedy the great injustice which the residents of the North of London suffer in respect to gas charges." The motion was carried.

MISCELLANEOUS NEWS.

THE GROWTH OF THE CROYDON GAS UNDERTAKING.

Important Extensions at the Works.

Among gas companies which have made marked progress, the one supplying Croydon and the surrounding district stands prominent. Time has wrought many changes in the town. Small insignificant shops in the main thoroughfares have given place to handsome buildings; and the splendid railway service to and from London, has made the district a popular residential one—evidence of this being presented by the number of new houses which have sprung up in all directions. This growth and prosperity is reflected in the pages of the Gas Company's books. Looking back over the accounts for the past twenty years, it is found that in 1873 the capital employed was only £106,280; but during the succeeding ten years, it mounted up to £212,350. In other words, it doubled itself to within £200. The expenditure of this large sum enabled the Company to meet the requirements of their customers for a few years; and up to 1892, the capital account was only augmented by £25,000. But some two or three years since, the Directors saw that, in order to keep ahead of their rapidly increasing business, they would have to make considerable additions to their plant; and they adopted a scheme of extension, which was drawn up by their Engineer (Mr. J. W. Helps, Assoc.M.Inst.C.E.). The effect of this was soon seen in the capital account; for, by the close of last half year, it had reached a total of £245,316, and now they have received tenders for a further £8500. But perhaps the progress of the undertaking is more strikingly shown by the output of gas during the period referred to. In 1873, the production was only 156,293,000 cubic feet; ten years later it had reached 282,592,000 cubic feet; but in 1892 it had attained the grand total of 477,246,000 cubic feet.

The extensions of plant and buildings which are now nearly completed form one section of a scheme which, when finished, will bring the works to the front among provincial gas undertakings south of London, both in point of size and modern equipment. Increased storeage accommodation being urgently required, two years ago a third lift was added to No. 2 holder; making its capacity 900,000 cubic feet, and bringing the total storeage capacity to 2,300,000 cubic feet. Among the plant put down at that time, or soon after, was one of Kirkham, Hulett, and Chandler's "Standard" washer-scrubbers, capable of dealing with 3 million cubic feet of gas per day; two of Walker's tar and carbonic acid extractors; and a new station meter, by the Gas-Meter Company, of a capacity equal to 100,000 cubic feet per hour, which replaced one of two meters of 45,000 cubic feet per hour capacity. In order to make room for the latter, the governors had to be removed; and two of them were substituted (on a new site) by two of Messrs. W. and B. Cowan's type. The Maxim-Clark process of enriching gas was also adopted. But the most important of the new works is a large stage-floor retort-house (with a spacious coal-store adjoining), which is now receiving the finishing touches. This is a substantial brick building, erected by Messrs. J. Aird and Co. It is 196 feet in length; the retort-house being 72 feet wide, and the coal-store 50 feet. From the vault-floor level (which is 4 ft. 6 in. below the stage floor), the former is 40 ft. 8 in. in height, or, measuring from the ground line, 36 ft. 2 in.; and to the apex of the ventilator or roof, from the-vault-floor level, it is 70 feet. The two roofs are formed, excepting the main rafters and struts, with flat iron, and slate covering; and abundant provision has been made by Mr. Helps for ventilation. The stage floor is composed of steel joists and trimmers; and the spaces between are filled in with cement concrete arches, which are turned on corrugated iron centres. The floor is being paved with blue checker bricks, excepting a strip immediately in front of the settings, which will be covered with fire-bricks set on edge; and close to the outer wall and that separating the house from the coal-store are cast-iron gratings, to afford ventilation to the furnace vault. Outside the house is a new spacious coke ground; and from here two inclines lead up to the charging-floor, and three declines to the vault. With regard to the settings, only two-thirds of the house are at present occupied; but it is estimated that it will produce, even now, 1,200,000 cubic feet of gas per day. Regenerative settings have been adopted; five being on Mr. J. West's principle, with eight through retorts in a bed, and five on Mr. G. Winstanley's plan, each containing nine through retorts. In West's settings, there is a generator on either side; while one generator does duty for both sides of Winstanley's settings. The retorts are ⏢-shaped, 20 ft. by 16 in. by 22 in. At the time of the visit of our representative last week, three of the settings were under fire; and it was expected that they would be at work in a few days. The benches are securely tied longitudinally by four rows of 2¼-inch tie-bars. The hydraulic mains are on both sides of the benches; and they are fitted with Messrs. Livesey and Tanner's tar-overflows. The mains are quite independent of the benches, and are supported by cross girders, attached to the steel buck-staves. Running round the house is a 20-inch wrought-iron foul main, suspended from cantilever brackets. Mr. Helps has in this case gone in for hot frictional condensation. West's manual charging and drawing machines have been adopted; and in the coal-store is one of West's coal-breaking and elevating machines, which delivers the coal into two large overhead hoppers (the one on the far side being supplied by means of an endless-band conveyor), from which the chargers are filled. Another important piece of work has been the extension of the overhead railway (by Messrs. Clayton, Son, and Co.) from No. 2 retort-house across the coke ground into, and the whole length of, the new coal-store. The new retort-house has been temporarily connected, by a 16-inch main, with the existing exhausters; and Messrs. C. and W. Walker are now erecting immediately outside a wrought-iron annular condenser, one or more pipes of which may, by a special arrangement of valves fixed at the bottom, be bye-passed, if necessary, when the make of gas is small in the summer time.

Some extensive alterations have also been made in the purifying plant. Formerly, there were twelve 24 feet square purifiers; but eight of these have been coupled up, and now measure 24 ft. by 54 ft. each. Four of the boxes are worked with lime in rotation; and the others are catch oxide boxes—working two on and two off. New overhead lifting apparatus and tramway have been erected; and the old 16-inch connections have been substituted by 24-inch ones. Another change has been the removal of the old sulphate of ammonia plant (which was only capable of producing 8 or 9 tons per week), and the erection, by Mr. Maurice Schwab, of a plant which is able, it is estimated, to turn out about 30 tons of sulphate a week. At the back of the sulphate-house, Claus's plant for the recovery of sulphur has been put up. A new entrance is being made leading to a road across the works to the new retort-house, together with a dock for loading coke, &c.

With regard to further extensions, a piece of land, about 5 acres in extent, has already been purchased; and, as was stated by the Chairman (Mr. C. Hussey) at the last meeting of the Company, the early erection of a new holder on this is contemplated—the existing storeage accommodation being now inadequate.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, No. 14, St. Mary Axe, E.C.—Mr. J. BLACKET GILL in the chair.

The SECRETARY (Mr. H. J. Luff) read the notice convening the meeting; and the Directors' report and the accounts, of which an epitome appeared in the JOURNAL for the 21st ult., were then submitted.

The CHAIRMAN, in moving the adoption of the report and accounts, said the shareholders would gladly notice there had been an improvement of between £1400 and £1500 in their gas-rental; but unfortunately they had lost on the residuals a sum of £2300. Coke and tar had not been selling as well as they could wish; but, on the other hand, coal had saved them something like £3170. He was pleased to say that, having made a contract for the next two or three years, he hoped they would still get their coal at a low figure. However, all their strivings to effect economy in the working were opposed by what one might call the "demon" of exchange. In this respect, they had been mulct to the extent of £23,071, which was an increase of £3876 upon the amount in the previous year. Consequently, after paying the debenture interest and income-tax, only £25,553 remained to the credit of profit and loss. Under these circumstances, the Directors felt very much regret in only being able to recommend a dividend of 8 per cent.; but it was consolatory to know it had been earned. In 1872, the rupee was worth about par, or nearly so; but since then it had been going on its downward course, until it had fallen in March last to nearly 1s. 2½d.; their last bills, however, were at nearly 1s. 3¼d. He believed it was hoped by people who knew something about this matter, that the rupee might go to 1s. 4d.; and, if it proved so, the Company would reap the advantage. There was another matter to which he had to draw attention, and that was their agreement with the Corporation of Calcutta for lighting the city. It would expire in 1901; and their Engineer (Mr. D. C. Niven) had had instructions to see the Chairman of the Corporation, with the view of extending the agreement for a further period of (say) twelve or fourteen years. As far as one was able to judge at present, the Corporation felt that the idea was somewhat premature; so that nothing definite had taken place. The Directors had expressed themselves ready at any time to enter into a friendly conference and terms that would be advantageous to both parties. He only mentioned this matter in order that the proprietors should clearly understand the exact position of affairs; and he was quite certain they would agree with him that it was not a subject to be discussed, because they might (he would not say they would or they would not) have to enter into delicate negotiations. In many companies working under concessions, it had been the practice to invest a reserve fund outside the concern; but it would be noticed that in their own case, they had what they called a reserve account. This, however, was simply a reserve invested in the works. For his own part, he liked a good reserve fund; and he really thought the shareholders reaped the benefit of it, even if they did not have quite so much dividend. This had not been the practice in their Company; and, as the Directors were proposing a reduction of dividend, they felt they could not ask the proprietors to make a further sacrifice, and put a portion of the money away in a reserve fund for investment (say) in Consols. However, they had strengthened the position of the Company during the year by paying off £6420 of the debenture debt; and this was a policy they would certainly continue, as long as they were able to do so without impairing the efficiency of the undertaking. He hoped the time would come when there would be no debenture debt remaining. By paying off the amount mentioned, they had saved over £250 a year, which was very satisfactory. He trusted that the proprietors would not take a gloomy view of the position of the Company. It was entirely a matter of exchange. The business was increasing; and, if they could get rid of some of the tremendous loss they suffered by exchange, there was no reason why they should not have a more gratifying statement next year than they had on this occasion. It would be noticed that they had cheap coal; and they had the advantage of no strikes. The Oriental agitator had not yet found a place where he could "spout" of the discomfort, trouble, and misery of the workmen. Only the previous week, too, they heard from their Engineer that the prospects of electric lighting were far from being bright in Calcutta. Therefore, under all the circumstances of the case, they might take a hopeful view of the future.

Mr. N. E. B. GAREY seconded the motion.

Mr. W. WHITLEY inquired if the price of gas had been increased since the rate of exchange had fallen to such a low point.

The CHAIRMAN replied that it had not, as the greater portion of it was supplied under contract.

Mr. MILLEDGE asked for an explanation as to the increase in the general expenses.

Mr. S. SPENCER thought it would be advisible, when a new concession was being entered into, for the Directors to try to make some arrangement whereby the price would work with the rupee—a kind of

sliding scale. He also expressed agreement with the remarks of the Chairman as to a reserve fund.

The CHAIRMAN, in reply, said, with reference to the general expenses, that the amount in 1891-2 was reduced to £487 owing to the death of one of their staff, upon whom they had an insurance policy for £300. Then in the past year the item was increased by the payment of a certain sum to the widow of their late Secretary. Regarding Mr. Spencer's suggestion, he thought it was a good one, if they could get the Corporation to fall in with it.

The motion was then unanimously adopted.

On the proposition of the CHAIRMAN, seconded by Mr. R. HESKETH JONES, a dividend of 4 per cent. was declared; making, with the interim payment, 8 per cent. for the year.

The CHAIRMAN next moved, and Mr. H. L. HAMMACK seconded, the re-election of Messrs. R. H. Jones and H. D. Ellis as Directors. This was agreed to; and afterwards, the Auditors (Messrs. Eastman and Savage) were re-appointed, on the motion of General TUPPER.

Mr. A. T. EASTMAN, in moving a resolution acknowledging the services of the Chairman and Directors, remarked that they were not only entitled to the thanks of the shareholders but to their sympathy; for, in the face of the fact that they had made a reduction in the cost of manufacture and distribution, and the gas-rental had increased, yet, through that uncontrollable difficulty of exchange, they had to meet the shareholders on this occasion with a reduced dividend.

Mr. SPENCER seconded the motion, which was heartily agreed to.

The CHAIRMAN having replied, a vote of thanks was accorded to the Local Committee, the Engineer, the Secretary, and the staff generally; and this concluded the proceedings.

BAHIA GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Thursday, at the London Offices, 9, Queen Street Place, E.C.—Mr. HORATIO BROTHERS in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice convening the meeting; and the Directors' report and the accounts—which were referred to in our last issue—were then submitted.

The CHAIRMAN, in moving the adoption of the report and accounts, said that the latter might well be regarded as satisfactory under the untoward condition of the exchange and the temporary character of the concession, as, under such circumstances, no well-considered and permanent plans could be put in force, or favourable contracts made for a period; but everything was hap-hazard and hand to mouth, much as the Directors had endeavoured to minimize these unfavourable conditions. Turning to the accounts, it would be found that the amounts owing to the Company were £6141 less than in the corresponding period of 1892, and were £5854 less than in the previous half year. The public lighting account for the six months ending June last stood at £1371; whereas, in the June half of 1892, it was £11,167, so that there had been a reduction of £9796, which was eminently satisfactory, considering the unsettled state of affairs prevailing in Brazil. The stocks in hand were about £650 less than in the first half of last year; while the invested reserve fund stood at £17,824, against £13,000. Turning to the revenue account, he said the consumption of gas had been augmented by about 1,500,000 cubic feet; and the money received by £950. The quantity of coal and cannel carbonized had increased by 150 tons; the make of gas per ton of coal was about the same; and the leakage—a variable quantity—was rather more. The receipts for residuals and the meter-rental were nearly the same. The expenditure, eliminating the charge for exchange in both cases, was £10,985 in the past six months, as compared with £10,383 in the corresponding period of 1892—being an increase of £602, of which £384 was for increase of salaries, necessitated by the Manager (Mr. G. Martin) taking his legitimate holiday, and paying a substitute to perform his duties, and £118 extra for trade charges. There was little change in the other items; and they called for no remark. The balance to be carried to profit and loss was £6650, as against £6289; being an increase of £361, and enabling the Directors out of the profits to pay the maximum dividends on the preference shares, and at the rate of 8 per cent. per annum on the ordinary shares, and leave about £400 to be added to the balance carried forward. Referring to the concession, the Chairman remarked that the agreement for a temporary renewal with the State authorities of Bahia would come to an end in February, 1894. The Directors had, through their Manager, offered to renew a working arrangement for not less than one year, under certain conditions; and this offer, so far as they were advised, had has no response from the Governor of the State, to whom it was made. The Directors declined to recognize the Municipal Authorities in this matter, or to submit to any re-opening of the award of compensation to the Company for the taking over of the works and plant, which was settled by arbitration, according to the stipulations of the concession, and ratified by the State Authorities of the time. Though many attempts had been made by the succeeding authorities, in terrorism and other ways, to induce the Directors to re-open arbitration, and to recognize an inferior authority, they had firmly declined to do so, and would insist on their legal rights.

Mr. H. FINLAY seconded the motion.

Mr. BLUNDELL said he had hoped that the Chairman would have been able to give the shareholders some information as to whether any arrangement had been come to with the authorities for a temporary renewal or a prolongation of the concession. At all events, they would be very glad if, without detriment to the interests of the Company, he could give them a little idea as to what steps the Board were going to take in view of the early termination of the contract.

Mr. MACHELL remarked that the shareholders generally had faith in their present Board; and he did not think they could do better than leave this matter entirely in their hands.

Mr. CROSS said he should have been glad if they could have ventilated this subject to a certain extent; but, having lived in the Brazils, he knew how detrimental it might be if anything were published.

The CHAIRMAN said he might state that they had given notice to the authorities that they would discontinue the lighting, except some steps were taken to renew the concession for a period from February next. He had no doubt that the concession would be temporarily renewed.

Mr. H. FINLAY thought that, under the circumstances, it would not be well to enter at length into this matter; but any shareholder could get the fullest information by calling upon the Secretary. They might rest assured that the Directors had but one interest, and that was the interest of the Company.

The motion was then unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. FINLAY, the maximum dividends on the preference shares and a dividend at the rate of 8 per cent. per annum (free of income-tax) on the ordinary shares were declared.

The CHAIRMAN then moved the re-election of the retiring Directors (Mr. H. Finlay and Mr. J. Darell Blount); and the motion, having been seconded by Mr. HORNER, was agreed to.

Mr. FINLAY, in returning thanks, remarked that he had been associated with the Company for about 20 years; and, being tolerably conversant with all matters of detail connected with it, he could say that things were more favourable than he should have anticipated under the circumstances. Not only Brazil, but the whole of Europe was at present under a cloud; and altogether he thought they had much to be thankful for.

The retiring Auditor (Mr. J. Wright) having been re-appointed,

Mr. BLUNDELL moved a vote of thanks to the Chairman and Directors; and, referring to his previous remarks, assured the meeting that he would be the last person to try to induce the Board to say anything in public which might, in the slightest degree, be detrimental to the interests of the concern.

Mr. COGAR seconded the motion, which was unanimously passed.

The CHAIRMAN, having acknowledged the compliment, proposed a vote of thanks to the Secretary, the Engineer, and the staff.

Mr. J. T. EDMONDS, in seconding the proposal, observed that, looking back over the reports for the past few years, it was satisfactory to note that, although Brazil was under a cloud, the balance carried forward in the past half year was much larger than it had been since 1889.

The motion was carried.

The SECRETARY acknowledged the vote; and the proceedings terminated.

SINGAPORE GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. R. M. Christie) having read the notice convening the meeting,

The CHAIRMAN said that, before commencing the ordinary business, he should be glad to have an expression of sympathy from the proprietors as to the loss of their late respected Chairman; so that the Secretary might communicate their condolence with Mrs. Foreman. Immediately on his lamented death, the Board expressed their sorrow.

On the motion of Mr. R. G. RICE, seconded by Mr. T. W. GREENE, a resolution was passed, requesting the Secretary to convey to Mrs. Foreman the deep sympathy of the shareholders in her bereavement.

Before the business proceeded, it was suggested by Mr. Rice that, at the present and future meetings, the minutes of the previous meeting should be read and confirmed. It has been the custom for the past 30 years for them to be read and signed at the Board meetings; but, as the Board had no objection, the suggestion was adopted.

The report and accounts (which were noticed in the JOURNAL for the 21st ult.) having been taken as read,

The CHAIRMAN said that, since their last meeting, they had had the misfortune to lose the services of their late Chairman; and he was exceedingly pleased that the shareholders had recorded their sense of his loss in the resolution just passed. He was quite sure it was richly deserved, as he had never known a man who devoted so much time and attention to the affairs of a company as Mr. Foreman had done to theirs. As they had probably noticed at several past half-yearly meetings, he had been far from well; and on the 1st of July—within six weeks of their last meeting—he passed away, to the great regret of all. He was a Director from the inception of the concern; and, during the last twelve years, he had been their Chairman. As they were thus left with less than their minimum number of Directors, it was necessary that the vacancy should at once be filled. They had two applications for the seat—Mr. Batten and another gentleman, who immediately withdrew his application on hearing who was opposing him. The Board then appointed Mr. Batten, as they felt convinced it was a choice which would give the greatest satisfaction to the shareholders, especially in view of the fact that he had been the Manager in Singapore for ten years, and knew the place, their customers, and the officers of the Government and Municipality—indeed, his aid and advice had already been of the greatest advantage to them. After this, it was necessary to appoint a Chairman; and he (Mr. Spencer) felt the honour his colleagues had conferred upon him in electing him to the position. It would be his earnest endeavour to carry out the duties of the office to the best of his ability, and to give the shareholders the utmost satisfaction, as his policy would be (and he was sure it would be supported by his co-Directors) to bring the Company into the old lines of a successful and fairly good dividend-paying concern—taking care at the same time to keep the works and plant in the most efficient order, to write down the values of their stocks to a reasonable sum, and to create a reserve fund for the purpose of equalizing the dividends, as they now saw how impolitic it was to pay dividends up to the hilt. Speaking of the working of the undertaking, he said that, in common with all foreign companies, they were suffering, to an alarming extent, from the loss on exchange—a thing they were all powerless to control, as the public lighting was paid for, under contract, at a fixed price in dollars; and, unfortunately, they had to take it for what it was worth. Then the private lighting was in such keen competition with oil, that it was quite impossible to increase the price of gas, besides which the dulness of trade militated against their success. Their Manager (Mr. H. W. Smith) strongly opposed—at all events for the present—an increase in their charge; and he was supported by Mr. Batten. Therefore, they had been drawn to the conclusion that

their savings must come from the purchase of coal at the cheapest rate, and by practising the utmost economy in every detail. When the works were first started in 1864, he saw, from the balance-sheet of that year, that the dollar varied from 4s. 6d. to 5s. 2d.; and it really made one's mouth water for such times again, as they could then easily reduce the price of gas and pay the maximum dividends. The dollar now had dwindled down to just about one-half, and, with other interested companies, they were wondering if the coin had touched the bottom. But there it stood; and no one at present could say whether the price of silver was likely to rise or fall, and therefore they must go on hoping for the best. At the time he was elected a Director two years ago, they were getting the dollar over at 3s. 3d.; while it was now 2s. 6d. Even since Mr. Foreman's death, it had dropped by 3d.; so that it made it almost impossible to hope, without a better price, to earn anything more than a moderate dividend. He could only ask for the patience and consideration of the shareholders in carrying on the affairs of the Company through these trying times. Their Manager informed them a little time ago that a monetary conference, composed of three sections—three Englishmen, three Chinese, and Germans and others—was being held to consider the question of the adoption of a fixed dollar; but only the previous day a letter was received from Mr. Smith, stating that a report had been sent to the Colonial Office, giving three opposite views, so that the chance of arriving at such a desirable result certainly appeared very remote. With regard to their coal supply, they had been fortunate in securing Japanese and Australian coal at very reasonable rates; the consequence being that the coal used in the past half year worked out cheaper than during the last seven years. Their plan was to buy in all cases, if the price and freight were reasonable, from England; but, if not, then to purchase such coal as could be obtained in Singapore. It seemed very probable that they would not be able to buy coal in England for some time to come; but their closest attention would be given to the subject. The Company's contract with the Municipality expired next May; and, six months since, the Directors approached the authorities with respect to an extension. They were pleased to say that a further term of two years had been granted; and the necessary agreement was now on its way to be signed and exchanged. The Board tried their best to get the extension for a longer period and to procure the same price. But the Municipality would not agree to a further period; and the price of $2·75, they wished reduced to $2·50. After some negotiation, however, it was fixed at $2·60; and this would stand for two years after next May. Turning to the balance-sheet, he mentioned that the half-year's trading worked out to about £200 better on the rental than in the previous half year; but the residual products had realized £240 less, owing to the dulness of trade, so that the result was approximately the same as in the corresponding period of 1892. With their favourable coal purchases, however, they had been able to make a net profit of about £1000; and this, added to the balance of £730, gave them a total of £1700 to deal with this half year. They had thought it prudent to write off various amounts equal to £670, which left a balance of £1067. It had been the earnest hope of the Directors that they would be enabled to declare a dividend this half year; but, considering the very uncertain position of the silver market, they would not advise it. He concluded by moving the adoption of the report and accounts.

Mr. W. T. Batten seconded the motion.

Mr. T. Guyatt observed that the shareholders could see, from the figures in the balance-sheet, that it would be very unwise indeed to part with any of the £1000 profit, as it was really required for carrying on the business. He hoped that there would soon be some improvement in exchange, or that some means of increasing the profit might be discovered.

Mr. Rice thought the shareholders must all be of one mind, that it would be extremely detrimental to the Company to pay a dividend now. There was no doubt that in the past the dividends had been too large; but they were not in a peculiar position at the present time in being unable to pay a dividend—there being, to his knowledge, several other companies who could not do so now.

Mr. Greene inquired the prices paid by the Company for English and Japanese coal.

The Chairman replied that they varied from week to week. The average price last year, taking both English and Japanese coal together, was £1 8s. 4d. per ton. English coal cost them about 3s. per ton more that the Japan or Australian supplies.

The Secretary pointed out that the Japanese coal was paid for in dollars; and this, on account of the constant fluctuation of exchange, allowed of no comparison with the price of English coal.

Mr. Dyer alluded to the discount of 10 per cent. allowed to consumers for prompt payment, and expressed the opinion that 2½ or 5 per cent. would be ample.

Mr. B. Green stated that the Directors had had this matter under consideration; and they were told that, if they made any alteration in the price or reduced the discount, they would lose a large number of their consumers. The present price was $3 per 1000 cubic feet, less 10 per cent. discount, which brought the price down to 6s. 9d. per 1000 cubic feet. This price gave a fair profit. It was the lack of consumers the Company suffered from. Were the consumers trebled, the price of gas would show a very good profit indeed.

The Chairman mentioned that the Directors had sent out a number of prepayment meters, with the object of extending the business. It might surprise the shareholders to learn that there were 17,000 houses in their district; and that they were only supplying 500—this being entirely due to the cheapness of oil.

Mr. Batten remarked that, in connection with the question of discount, it ought to be pointed out that the bank rates and discounts were totally different in England to what they were in the East. Two years ago, one could get easily at Singapore from 8 to 10 per cent. for money at a time when 4 per cent. could hardly be obtained in England. Therefore they had to offer the consumers some inducement to pay their accounts, as otherwise they had good reason for keeping it deposited at the bank.

The motion was unanimously carried.

Mr. Greene then addressed the meeting at some length on the question of exchange, and concluded by moving—"That this meeting of the Directors and shareholders of the Singapore Gas Company requests the Colonial Office to memorialize the Government to take steps to rehabilitate silver as money."

Mr. Dyer seconded the motion, which was agreed to.

The services of the Chairman and Directors and the officers and staff were suitably acknowledged, and the meeting then terminated.

PROPOSED NATIONALIZATION OF THE MINES AND MINERALS OF THE UNITED KINGDOM.

A Bill to nationalize the mines and minerals of Great Britain and Ireland, and to provide for their working, has been brought in by Mr. Keir Hardie, Mr. John Burns, and others, and now awaits second reading. It is a short measure; consisting of only five clauses and a schedule. The following is an epitome of the Bill:—

The preamble sets forth that, whereas coal has become an essential factor in the manufacturing industries and transport service of the nation, any interference with a regular and continuous supply is fraught with great dangers to our commercial supremacy; that the supply of coal is limited, and, when exhausted, can never be replaced; that the present system of working mines as private concerns leads to much waste of our mineral supplies, and to strikes and lock-outs, and thereby imposes great hardship on the mining community and trades dependent on a mineral supply for their continuance; and that the nationalization of the minerals and the mines would secure their economical working, the just treatment, and consequent contentment, of the mining population, and a continuous and cheap supply of coal and other minerals. The first clause provides that, on and after Jan. 1, 1895, all mines and minerals within the United Kingdom are to be transferred, in fee simple, to the Crown, and are thereupon to become the property of the nation. The next clause specifies that all persons who are owners, in whole or in part, of such mines and minerals shall, on or before May 1, 1894, make a full and complete return to the Secretary of State for the Home Department, showing the extent and nature of their pecuniary interest therein. The third clause places upon the Home Secretary the duty of appointing duly qualified valuers, who are to assess the value of the mines and minerals without regard either to the amount of capital invested or the prospect of profits on the working thereof. The valuers are to report the result of their labours to the Home Secretary, who is to issue an order upon the Treasury for the amount of the value so ascertained. On the receipt of this order, the Lords of the Treasury are to issue, to the persons who have established their claim to be reckoned owners of the mines or minerals, bonds to the amount of their interests as found to exist at the date of the transfer to the Crown. These bonds are to bear interest at the current rates, *plus* 3 per cent. on the capital amount, to form a sinking fund for the redemption of the capital sum. The interest on the bonds, together with the sinking fund, is to form a first charge upon the working of the mines. Prior to Jan. 1, 1895, the Government are to create a special Mining Department, with a President, who must be a member of the House of Commons, invested with full powers for the direct working and conducting of the mining industry of the United Kingdom, without the intervention of any contractor or lessee, in such a way as will supply the legitimate demands for coal and other minerals, and ensure the safety and comfort of the persons employed. The Mining Department are to pay such wages as will ensure "a healthy and comfortable existence to the said persons and their dependents." No woman, or any young person under 15 years of age, is to be employed underground; nor is anyone to be allowed to work alone in a mine until he has first served an apprenticeship of three years' duration. The fourth clause specifies that nobody is to be employed in a mine for a longer period than eight out of any 24 hours; the time to be reckoned from the hour of descent into, to the hour of ascent from, the mine. In the case of accident, fatal or otherwise, to any person employed in or about a mine, and sustained while in the performance of his duty as a workman, or any person unable to follow his occupation from old age, sickness, or other cause, over which he has no control, compensation or provision is to be made in the terms of the schedule. The cost of this compensation or provision is to be a charge upon the working of the mines. The fifth clause states that, on the establishment of a local Parliament for any part of the United Kingdom, the powers conferred upon the Mining Department, in so far as they relate to the country over which that Department has control, are to be transferred to, and vested in, the Executive Government responsible to such Parliament. The schedule above referred to sets forth that during the continuance of incapacity, the result of an accident sustained while at work, or of sickness, the workman is to receive his full weekly wages, and free medical and other attendance. In case of fatal accidents, the average wage for the time being prevailing is to be paid to the legal personal representatives of the person killed, for a period equal to the actuarial anticipation of the life of the person deceased. Persons retiring from work in the mines are to receive, for each year of completed service, a superannuation allowance equivalent to 1-60th of their average yearly earnings during the period of five years immediately preceding the date of retirement. In the event of the decease of a person receiving a superannuation allowance, 75 per cent. of it is to be continued to the widow or other dependent relatives. Superannuation or other allowances to which any person may be entitled are not to be forfeited by dismissal or any other cause.

The Electric Lighting of Londonderry.—The Corporation of Londonderry announce that their electric lighting scheme is now nearly complete, and that the greater part of the city will be lighted before Christmas. The full amount to be expended in connection with the several contracts is £15,793; but from this there has to be deducted £2200 chargeable to private lighting account, which will make the net cost of the installation (160 arc lamps) £13,593. The electrical work is in the hands of Messrs. Siemens, Bros. and Co.

THE BOARD OF TRADE REGULATIONS FOR PROTECTING GAS AND WATER PIPES FROM ELECTROLYSIS.

Our readers may remember that the Electric Powers (Protective Clauses) Joint Committee of the present session reported that statutory powers for the use of electricity by tramway and railway companies should be qualified by regulations to be made by the Board of Trade for the protection of the electric circuits of other parties, and the pipes of gas and water companies, &c. (see *ante*, pp. 38, 181). These regulations have now been prepared, and submitted in draft for the consideration of the Board. The following are among the provisions:—

All dynamos are to be of a pattern and construction capable of producing a steady continuous current. One of the two conductors used for transmitting energy from the generator to the motors is to be in all cases insulated throughout its length. This conductor is referred to in the regulations as the "line." The other conductor—the "return"—may be insulated throughout, or may be uninsulated in such parts and to such extent as is provided in the regulations. When any part of a return is uninsulated, it must be in connection with the negative terminal of the generator; and in such case the latter is to be directly connected, through a current indicator, to two separate earth connections located not less than 20 yards apart. In place of these two connections, the Company may make one to a water-main of not less than 4 inches internal diameter, with the consent of the owner thereof. When any portion of either earth connection is placed within 6 feet of any pipe, and the Company are unable to obtain permission to metallically connect it with the earth connection, they are to provide, by means of a non-conducting screen, that no current can pass between the pipe and the earth connection, without traversing at least 6 feet of earth. The efficiency of the earth connections is to be maintained so as to fulfil the following conditions: (1) That the current passing from the earth connections to the generator shall not at any time exceed 10 ampères. (2) That if a test be made, by connecting a galvanometer or other current indicator to the uninsulated return and to any pipe in the vicinity, the direction of the current is to be from the return to the pipe, and not *vice versâ*. (3) That, under these conditions, it shall always be possible to reverse the direction of the current, by interposing a battery of three Leclanché cells connected in series. In order to provide a continuous indication that the first condition is complied with, the company are to place in a conspicuous position a suitable current indicator, and keep it connected during the whole time the line is charged. The owner of any pipe may require the Company to permit him to ascertain by test that the second and third conditions are attended to as regards his pipe. When the return is partly or entirely uninsulated, its electrical resistance is to be tested by the Company at least once every three months; and if it has increased by more than 15 per cent. above the value recorded at the time the tramway was opened, the company are to take immediate steps to reduce it. Every electrical connection with any pipe is to be so arranged as to admit of easy inspection, and is to be tested by the company at least once every three months. Every line and every insulated return or part of a return is to be constructed in sections not exceeding half a mile in length; and means are to be provided for isolating each section for purposes of testing. The insulation of the line, and of the return when insulated, as well as of all feeders and other conductors, is to be so maintained that the leakage current shall not exceed 0·01 ampère per mile of tramway. The leakage is to be ascertained daily, before or after the hours of running, when the line is fully charged. If at any time it should be found that the leakage exceeds 0·1 ampère per mile of tramway, the running of the cars is to be stopped until the leak has been localized and stopped. The insulation resistance of all lines, insulated returns, feeders, or other conductors laid below the surface of the ground must not fall below the equivalent of 10 megohms for a length of a mile. In the remaining regulations it is specified that the Company are to so construct and maintain their system as to secure good contact between the motors and the line and return respectively; and they are not to allow sparking to occur at the rubbing or rolling contacts in any part. In cases where the line or return, or both, are placed in a conduit, conditions are laid down in respect to the construction and maintenance of the conduit. It is to be so constructed as to admit of easy inspection and access, and to be readily cleared of dust or other *débris*. If it is formed of any non-metallic material not being of high insulating quality and impervious to moisture throughout, and is placed within 6 feet of any pipe, a non-conducting screen is to be interposed between the conduit and the pipe, of such material and dimensions as shall provide that no current can pass between them without traversing at least 6 feet of earth. Finally, the company are, so far as may be applicable to their system of working, to keep certain records which are specified, and which, when required, are to be forwarded for the information of the Board of Trade.

Mansfield Corporation Gas-Works.—On the recommendation of the Gas Committee, the Mansfield Town Council have resolved to purchase one of Clapham Brothers' "Eclipse" washer-scrubbers, at a cost of about £400.

County Councils and Private Bill Legislation.—In consequence of the similarity of interests of the counties of Middlesex, Kent, Herts, Essex, and Surrey, a Committee has been formed of the Chairmen of the Councils of those counties for "mutual protection and benefit, especially as regards Parliamentary Bills promoted at the instance of, or other action taken by, other authorities detrimental or injurious to the counties named." The Chairman of the Middlesex Council (Mr. Littler, Q.C.) and the Deputy-Clerk to that body (Mr. W. G. Austin) have been appointed Chairman and Clerk respectively. The members of the House of Commons for the counties mentioned, and those members of the House of Lords who are interested in these counties, will be *ex officio* members of the Committee. The boroughs of West Ham and Croydon have refused to join the combination.

THE LONDON COUNTY COUNCIL AND THE METROPOLITAN WATER SUPPLY.

Analyses of London Water—The Water Companies' Accounts.

At the Meeting of the London County Council last Tuesday, the Water Committee reported that their attention had been directed to the desirability of an independent examination, on behalf of the Council, of the water supplied by the London Water Companies who derive the whole or part of their supplies from the Thames or the Lea. The expense would not, they were informed by the Chemist (Mr. W. J. Dibdin), exceed 10s. a sample; and they therefore recommended—"That, subject to an estimate to be submitted to the Council by the Finance Committee, as required by the statute, the Chemist be instructed to take 16 samples weekly of the water supplied by the London Water Companies, other than the Kent Company, at varying points—14 of such samples to be taken from the mains, and two from the vicinity of the intakes; and that he do submit the results of analyses of such samples to us." The presentation of the report, and the motion for its adoption, gave rise to a discussion. Mr. Lyon opposed the recommendation; saying that sufficient evidence had been obtained on this matter for the Royal Commission; and independent analyses were still being regularly made under the regulations of the Local Government Board. The proposed expenditure would be a waste of £600 to £800 a year, and would do nothing towards providing new sources of supply or securing control of the Water Companies. He moved, as an amendment, that the proposition be referred back to the Committee. Mr. Westacott seconded the amendment, and said he could not see any use in the proposal. Major Probyn remarked that it was much more satisfactory to have analyses by their own officer. Dr. Collins said the accuracy of the reports of the gentleman nominated by the Local Government Board had never been impugned; and the proposal seemed like a work of supererogation. Alderman Beachcroft said it would be wrong to do over again the work done by Government officials. One water report this month showed in a remarkable way the purifying power of a running stream. In spite of heavy rains after a dry month, the water was entirely satisfactory. Mr. J. Lloyd pointed out that this report was from gentlemen paid by the Water Companies. Mr. Bassett Hopkins (Chairman of the Committee) said they ought to economize, unless they were of opinion that the analyses proposed would yield material results. The amendment to refer back the proposal was carried.

The Water Committee further reported the result of their proceedings in regard to the accounts of the London Water Companies. On the 11th of July last, the Council authorized the Committee to incur an expenditure of £250 in obtaining a report on these accounts. Tabular statements had been received from the financial expert employed by the Committee; but they would have to be printed before they could be fairly considered. The cost would somewhat exceed £50; and it could not be incurred without the sanction of the Council. They therefore recommended—"That, subject to an estimate to be submitted to the Council by the Finance Committee, the Committee be authorized to have the statements of accounts printed." This was agreed to.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I have a difficult task before me this week, in the handling of the subject of Mr. John Laing's paper on oil gas, which he read on Monday night before the Royal Scottish Society of Arts. The difficulty arises chiefly on account of this, that Mr. Laing acknowledged that as yet he had only worked experimentally. It is therefore impossible to say anything regarding the value of his invention. It would have been better had he, like Mr. Young, of Peebles, waited until he could lay results before his hearers. In Mr. Young's case, he declined, and rightly declined, to allow his invention to be placed before the public until he had tested it practically. Mr. Laing could only speak on Monday night of one make of gas by his Linlithgow plant; and it is to be observed that, although he had been speaking of his being a better process than Mr. Young's, because of the heat required being less, yet it was in the matter of heat that his trial fell short. This shows the disadvantage of relying upon laboratory experiments. As to the comparative merits of the production of pitch or coke, that is a subject upon which everyone may agree to differ; and Mr. Laing acknowledged that. On the subject, however, of the permanency of the gas produced by his process, he could say nothing. In fact, he very deftly appropriated what had been done by others, both in the matter of permanency and illuminating power. Now in that it is just possible he may be wrong. In his process what is condensed and returned to the still is the heavier oil vapours; but what passes on to the superheater is also simply oil vapour. It is only in the superheater that it is converted into permanent gas. What if some of it—say, by the heat of the superheater getting low—were to pass from the superheater into the gas-holder without being gasified; it would be simply an oil vapour, and would condense. There is no provision for condensing and returning to the superheater, and once a particle of vapour got away from the superheater, it could only be found in the after plant condensed. Again, on the matter of illuminating power, is it not possible that, if a considerable portion of the elements of the oil is left in the bottom of the still in the form of pitch, the illuminating power of the gas may be lower than if carbonization had been carried to the length of making coke? It may be the other way, and that the carbonizing of the pitch might lower the illuminating power; but in either case the question is raised whether the illuminating power must necessarily be the same in Mr. Laing's as in other processes. In these remarks, I have compared the process with that of Mr. Young, because it was so treated by Mr. Laing himself, and also because Mr. Young's is the only system with which it can be compared. In that connection, there is more to be said. It is evident that Mr. Laing's invention was published before that of Mr. Young. I have now before me the Trans-

actions of the Royal Scottish Society of Arts; and I find that on Dec. 14, 1891 (which is nearly a year before Mr. Young's invention was brought out), Mr. Laing read a paper before the Society on the "Destructive and Conservative Distillation of Mineral Oils, and their Molecular Conditions," in connection with which he exhibited drawings of apparatus almost identical with that published in the Register of Patents in the JOURNAL for the 21st ult. It is true that in this paper the purpose of the apparatus was the making of oil; and Mr. Laing on Monday night explained that he began his investigation of the subject in considering how to break down Russian oils. Still, in his paper of 1891 Mr. Laing said: "If you push this force to the extreme, I have no doubt you will at last rupture the chemical affinity; and your ultimate molecule will be broken up into its component parts, hydrogen and carbon—the former escaping as a permanent gas, and the latter being left behind in the still. The great heat or force employed unties the bond of chemical affinity and liberates the atoms." This passage shows that, so far back as then, Mr. Laing recognized that it was possible to produce a permanent gas by means of plant which he had invented. It is open to observation that he characterized the permanent gas as hydrogen, and seemed to have no notion of making illuminating gas; and that he does not yet say whether his plant has ever been wrought anywhere. It may also be remarked that Mr. Young stated that he was led to adopt his form of apparatus by considering the process which is common in oil-works, of distilling oils so as to keep certain elements in; and that by his oil-gas process, all that he did was to liberate and carry away certain elements which, in the oil-works, they sought to retain and send back in a liquid form. So far there are similarities between the two systems, which may lead to complications; but, on the other hand, there are differences which are distinctly marked. For instance, while Mr. Young employs no superheater, and uses the inflowing oil merely for purposes of condensation—the gas being made by one method of working, Mr. Laing condenses simply by the difference of temperature; and in his process gas is made by two separate and distinct acts.

The Falkirk Town Council are bungling their case with reference to the taking over of the Gas Company's undertaking. On account of the suddenness with which the subject was sprung upon them, they had not time to get advice; and at first they proceeded upon their own notions. One of these was that they should take over the works and undertaking of the Company; and the Clerk drafted a minute to that effect, which was adopted. After that they called in both London and Edinburgh legal assistance; and as the result, I believe, of the Edinburgh gentleman's advice (who is Mr. John Blair, W.S., the law agent and adviser of the late Edinburgh Gas Company), they resolved that it was the lighting of the burgh they were to acquire power to provide. In their parliamentary notice both subjects are stated; but it is the latter that is in their mind's eye. Their intention is to erect new works. It is scarcely credible, but the Council, at a meeting on Monday, actually directed the Clerk to alter the minute of the former meeting, by taking out "to acquire the gas-works," and inserting "to take over the lighting of the burgh." The unwisdom of this step is not so much that it is manifestly the result of an after-thought, and weakens their case by presenting indecision to the Parliamentary Committee, as that the reason for it is so apparent. It can have no other motive than to serve as a lever to get better terms from the Gas Company; it is, in fact, a lawyer's move. But is it likely that any Parliamentary Committee would pass a measure which would have the effect of extinguishing the Gas Company? One member of the Council made the remark that the Company were not incorporated, and could not expect such good terms as if they were. That may be true; but there is a difference between extinction and a question of terms. Attempts on both sides to drive a hard bargain are to be deprecated. We do not know yet what the Gas Company's suggestions are, because the Directors have not yet considered the proposals of the Corporation Committee. These are: (1) That there shall be no compulsory purchase clause; (2) that there shall be no goodwill; (3) that the valuation shall not proceed upon dividend; and (4) that the Arbiters shall take into consideration the usefulness and uselessness of the works.

A meeting of the Edinburgh and Leith Gas Commission was held on Monday, at which Mr. Kinloch Anderson was re-appointed Convener of the Works Committee, and Mr. R. Younger was appointed Convener of the Finance and Law Committee. Mr. Kinloch Anderson has already held the office for two years; and it is appropriate to say that under his direction the work has been most capably done. He has a thorough grasp of gas matters; and is one of the steadying influences in the Commission, where there are not a few weak members. An application by the Town Clerk of Portobello, asking for the terms upon which the Commission would supply gas in bulk to the Portobello Council for public lighting, was submitted. Bailie Archibald took the view that the Commission had not the power, because the burgh of Portobello is excluded from their area of supply; but Lord Provost Russell directed attention to a clause in the Commissioners' Act of Parliament which gives them power to sell gas in bulk to local authorities outside the area of supply. The Commissioners favourably entertained the application, and sent it to the Works Committee.

With commendable alacrity, the Directors of the Carnoustie Gas Company have had the gas supply restored, after the disaster to the works caused by the gale of a fortnight ago. The works were stopped on Saturday morning; and on the evening of the succeeding Saturday gas was again supplied, to the great delight of the inhabitants. During the week of reconstruction, there was a great deal to be done. A temporary chimney had to be built; a new section had to be put into the hydraulic main; and ascension, bridge, and dip pipes had to be fitted. Mr. R. S. Carlow, of Arbroath, superintended the work of restoration.

The Aberdeen Corporation Gas Committee having been re-constructed after the elections, on Wednesday afternoon paid a visit of inspection to the gas-works, which is a very sensible thing to do, as it enables the new members to better understand their duties. They first visited the new gasholder which is being constructed on the links at Gallowhill. There they found that, though the work was not begun a year ago, the whole of the excavation has been made, and the building work is all but completed. This work has been done by men who were taken on because they were out of employment, under the supervision of the Gas Manager (Mr. A. Smith), without the intervention of a contractor; and the Committee expressed their utmost satisfaction at the manner in which it has been performed. Proceeding to the gas-works, the Committee were shown over them, and found everything in the best order. West's stoking machinery, particularly, was found to be working up to expectation. The Committee were then taken into the electric lighting station which the Corporation are fitting up alongside the gas-works. The plant there includes five Babcock and Wilcox tubular boilers, with five engines of 80-horse power each, directly coupled to dynamos. Addressing the Committee afterwards, the Convener (Mr. Johnston) spoke approvingly of the employment of the unemployed for the work at Gallowhill; and referring to stoking machinery, he said it was an immense improvement over the old system, which he considered was an inhuman method. It was stated that the electric lighting installation would not be ready before the middle of January.

The unfortunate strike which has broken out among the miners chiefly in the West of Scotland continues, with little prospect of a settlement. It is estimated that of the miners themselves there are 33,000 idle, while 16,000 others, who have been granted the demand for an increase of 1s. per day, are at work. This week the Fifeshire coalmasters agreed to give an advance of 6½ per cent., which will raise the wages per man to from 5s. to 5s. 6d. per day. In 1888, the rate per man was 4s. per day. The concession by the masters is not giving satisfaction; and it is probable that another rise of 6½ per cent. will be demanded. Fifeshire is at present the main source of supply in Scotland; and should the strike spread to it, a critical situation would arise. As it is, coal is getting scarce. So far, I have not heard that the gas supply is affected—indeed, the only places where it is stated that straits are being experienced are Glasgow and Gourock. At the latter town, the Gas Manager has received instructions to buy coal at as high a price as 25s. or 30s. per ton. One of the greatest sufferers is the North British Railway Company, some of whose contractors for the supply of coal are involved in the strike. They have had to lay off a large number of trains for want of fuel. The Company run an electric lighting plant in Queen Street Station, Glasgow; and on Monday night their steam power failed them, and the station had to be lighted with gas for a time. Should a settlement not be arrived at, there can be no doubt that gas-works will soon suffer; but there is so very little separating the parties, that it is surprising they do not come to terms. The men, though demanding 1s., have offered to take 6d. per day till Feb. 1, and to submit their case to a Board of Conciliation. All the difference is that the masters insist that the Board of Conciliation should have power to reduce wages before Feb. 1, while the men decline to agree to them having that power. The smallness of the difference lends colour to the view that the masters may only be playing for an opportunity, under stress of the strike, to break contracts; and that, if they succeed in this, they will give the men the advance. The situation, it is to be observed, is by no means the counterpart of that which existed in England a week or two ago, because, to the extent to which the Scotch supply was capable, gas-works proprietors in England could get supplies from here. But English coal will not do in Scotland, where the illuminating power of gas is much higher than in England. That is a consideration which must not be lost sight of. Because of it, the situation in Scotland will be much more embarrassing than it was in England. Whichever way the strike ends, it is likely to give an impetus to the introduction of oil gas and carburetting plant into gas-works. There is another element for serious consideration in connection with the strike, in the diminution of gas consumption which is certain to attend the laying idle of so many public works. Even though coal contracts should not be broken, that fact alone is sufficient to cause anxiety to gas producers, as the as the returns for the year will be seriously affected by it.

The situation in which the Glasgow Corporation Gas Committee find themselves is a serious one. At a meeting of the Committee on Thursday, it was stated that the supply of coal on hand would be sufficient to last for a week. The Committee thought that in the meantime there was no great ground for alarm; and all they did was to resolve to urge upon contractors to fulfil their contracts with all despatch. Considering the situation as it exists to-night—negotiations for a settlement, in which Lord Provost Bell, of Glasgow, agreed to act as mediator, having fallen through—it seems to me that a coal supply which will only last for four days is sufficiently small to give cause for great alarm. I sincerely hope that they may get in sufficient to keep the works going.

I regret to have to report that on Tuesday night Mr. R. B. H. Thomson, Manager of the Broughty Ferry Corporation Gas-Works, met with an accident in the works. He was in the engine-room, and fell in such a way that his left foot rested on the top of the engine cylinder. The descending piston-rod, before he could get his foot removed, crushed it against the cylinder. Several nasty flesh wounds were inflicted; but happily no bones were broken.

The Pontypridd Water Company Summoned.—At the Ystrad Police Court on Monday last week, the Pontypridd Water Company were summoned for having, on Oct. 28 last, unlawfully neglected to supply Mr. Thomas Price, of Mardy, with pure and wholesome water. Mr. Plews appeared for the defence; and, at the outset, objected to the proceedings on the ground that the Company were not bound under their Act to supply the complainant at all, as his house was above the point at which water could be supplied by gravitation from the present reservoir; and the arrangement made for the supply was purely a temporary system pending the construction of the new reservoir for which the Company obtained parliamentary powers last year. The evidence showed that, on the day in question, the water-tap in plaintiff's house became blocked; and, when it was examined, filthy stuff emanated from it. Mr. Plews declared that the complaint was an isolated occurrence, and was entirely due to an accident; and he called Dr. Morgan, the County Analyst, who stated that water taken from the pipes on Nov. 20 showed, upon analysis, that it was the best water in Glamorganshire, and free from organic impurities. The summons was dismissed.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 2.

Sulphate of Ammonia.—The firmness of the market is unabated; and very full prices have been paid during the week, and at the moment the market is well cleared. A few second-hand parcels have made their appearance, which must be expected after a rapid advance; but the quantity is insignificant, and, if less than the market price is named, it is no doubt done for a purpose. Speculators quote £13 10s. for December delivery; but, as spot parcels are worth £13 12s. 6d. to £13 15s., the lower quotations may be ignored. There is considerable inquiry for forward delivery. But there are very few sellers; and even speculators are looking on—the future of the market being so doubtful, and the present tendency is decidedly in favour of a maintenance of values. There is still an apparent small production; the strike of Scotch miners having somewhat disorganized business in the North. There is a rather better feeling in nitrate.

LONDON, *Dec.* 2.

Tar Products.—The cessation of the coal strike does not seem to have had any detrimental influence on the value of pitch, business in which has been done at prices somewhat in advance of those of last week; 28s. having been reported. Benzol, however, is very flat; and but few orders are in the market—1s. 6d. for 50's and 1s. 5d. for 90's being considered about the current value. Carbolic acid remains at the price fixed by the Tar Products Committee; and considerable business has been done. Carbolic crystals appear to be influenced by the improved price of crude, and have slightly advanced beyond recent figures. Solvent naphtha continues in good request; and the demand for heavy naphtha is also better. Anthracene is quoted at last week's prices. Prices are as follows: Tar, 15s. to 16s. Pitch, 26s. 6d. to 28s. Benzol, 90's, 1s. 5d.; 50's, 1s. 6d. Creosote, 1¾d. Creosote salts, 25s. Solvent naphtha, 1s. 5d. Toluol, 1s. 8d. Crude benzol naphtha, 30 per cent., 8½d. Carbolic acid, 60's, 1s. 7d.; crystals, 5¾d. Cresol, 1s. 4d. Anthracene, 30 per cent., "A," 1s. 2d.; "B," 10d.

Sulphate of Ammonia has remained steady during the week at from £13 7s. 6d. to £13 12s. 6d.; and should the colliery strike in Scotland continue, the probability is that sulphate may be benefited. But so long as the price remains at about to-day's figures, makers will have little room to grumble. Gas liquor is quoted at 8s. to 9s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week, business has been getting back into something like its normal condition; and prices have settled down to about the level which is likely to rule during the remainder of the winter. The principal Manchester colliery concerns have brought back their rates for round coal to within 1s. 8d., and for engine fuel to within 10d. per ton of those ruling prior to the stoppage of the pits. In the South Lancashire district, which embraces the most important mining centre of Lancashire, there has scarcely been the same unanimity with regard to any actually fixed basis of prices. At a meeting of representatives of the principal collieries, the matter was discussed; and ultimately some sort of an arrangement was come to by which the minimum pit prices were understood to be fixed at about 14s. to 15s. for the best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet, 11s. 6d. to 12s. for ordinary qualities of round coals, 10s. to 11s. for steam and forge coal, with engine fuel ranging from 6s. 6d. to 7s. as the minimum prices for slack to 8s. and 8s. 6d. for burgy. It can scarcely be said, however, that this basis of prices is accepted all through; and since the meeting there has been some underquoting to secure business, with the result that, although they may be fairly well maintained while there is an absence of stocks, they are most likely to give way as soon as any extra quantities of fuel come upon the market. These prices represent an advance of about 1s. 6d. to 2s. upon round coal, as compared with what would have been the winter rates under ordinary circumstances, and a return, as regards engine fuel, to the prices which were ruling during the winter of 1890. There is no great pressure of demand in the market. Coal from outside districts continues to be offered at low figures; and altogether the prospects of any advanced prices being maintained in the coal trade, beyond the next two or three months, are not at all encouraging. As to the settlement which has been come to, very doubtful feelings prevail whether it will prove to be of a permanent character. The first meeting of the Conciliation Board is to be held this month; but both sides still hold on to very widely divergent views on the question of wages, so that it will very largely depend upon the character of the Chairman who will be appointed as to whether this arrangement will more than effect a temporary settlement of the dispute.

Northern Coal Trade.—There has been an enlarged demand for coal, and prices are in some instances higher than a week ago. The arrival of steamers which were delayed by the storm, and the interruption of the Scotch supply, caused great briskness; and better prices have been obtained for such lots as were to be secured. The prices for best Northumbrian steam coals have of late been quoted at from 13s. to 13s. 6d. per ton f.o.b.; but for forward orders, especially for delivery after the holidays, much lower prices prevail. The output is still well maintained; and there is a correspondingly large sale of small coals. But less of this kind of coal is now being sent to the Midlands, so that, with large local supplies, the price quoted here is about 5s. to 5s. 6d. per ton f.o.b. In gas coals there is a keen demand, both locally and for distant gas companies; and for three weeks or so this may be expected to continue, when a falling off may be looked for. Much of the coal is being delivered on old contracts, at prices that are very low; a little is being sold, at rates that vary from 10s. to 11s. per ton f.o.b.; and there is a good deal of coal being negotiated for at prices that may be nearly midway between old and current rates. Coke is also very firm, and is rather difficult to obtain; the rate being about 16s. per ton. Gas coke is unaltered in price, with a very large output at present. Many of the collieries of the North are behindhand in their deliveries, because of the want of waggons; and the complaints against the railway company are very loud. With a full supply of carrying facilities, there might have been, during the last few days, a much larger delivery of coal on contract to some of the gas companies, who are now asking for their full quantities.

Scotch Coal Trade.—On account of the strike among the miners, very little can be said about the coal trade in Scotland. Prices have risen so much, and are so various, according to the needs of the purchaser, that they cannot be relied upon. The latest figures as to shipments do not yet show a decrease; those for last week not having come in yet. For the preceding week, the total was 171,079 tons—an increase of 2492 tons over the preceding six days, and of 21,647 tons compared with the corresponding week of last year. For the year to date, the total shipments have been 7,179,863 tons—an advance over the same period of last year of 160,772 tons.

Hollingbourne Water Supply.—On Wednesday last, new water-works constructed by Messrs. A. M. Pryor and Co., of Maidstone, for the Hollingbourne Rural Sanitary Authority, were opened at Pye Corner, Ulcombe.

Fatal Accident at the Bolton Gas-Works.—A man named Robert Wood, aged 43, while engaged in removing hot clinkers from the retort-furnaces at the Bolton Corporation Gas-Works recently, was scalded so terribly that he died in the Infirmary last Tuesday. It appears that some of the material he was handling fell into a receptacle containing hot water, a quantity of which splashed over the unfortunate man.

The Water Supply of Dublin.—Recent rains have so increased the volume of water flowing in the Vartry River, and the Roundwood reservoir has been filling so satisfactorily, that the Water Committee last Thursday felt justified in putting the north side of the city on a continuous supply. On the south side, the supply, for some time to come, will be continuous from the Grand Canal. The works in process of construction to make the Royal Canal water available for the north side are being vigorously pushed forward.

Increase in the Price of Gas at Birmingham.—The termination of the coal strike afforded the Birmingham Corporation Gas Committe at their meeting on Monday last week an opportunity of estimating its cost. The collieries from which the Committee generally draw their supplies of coal were stopped almost during the whole period of the strike; and contracts at very much increased rates had to be entered into with the proprietors of pits that were at work. It has been ascertained that the additional cost of the strike to the department was £25,000; and, in consequence of this, the Committee will recommend at the meeting of the City Council to-day that the price of gas should be increased, from the beginning of next quarter, by 3d. per 1000 cubic feet. There is a graduated scale of charges, which at present stands as follows: Consumers of 50,000 cubic feet and upwards pay 2s. 3d. per 1000 feet; 25,000 to 50,000 feet, 2s. 5d.; consumers under 25,000 feet, 2s. 7d.

Sales of Stock and Shares.—A large variety of shares in south-eastern gas companies were recently sold by auction at Chatham, by Messrs. Thomas and Stone. The following prices were obtained: *Canterbury Gas Company*—£20 "A" stock sold at £35 10s.; and £100 "B" stock, at £175. *Gravesend Gas Company*—Eight £20 shares (old issue) realized £43 10s. each; and six £20 shares (new issue), £33 10s. *Sheppy Gas Company*—14 £10 shares produced prices ranging from £20 10s. to £21 15s. each; 18 £10 "C" shares (£7 10s. paid), £11 10s. to £12; and three £20 "D" shares (£10 paid), £21 2s. 6d. *Sittingbourne Gas Company*—Ten £20 shares fetched from £36 to £37. *Maidstone Gas Company*—£68 stock sold for £144 10s. *Northfleet and Greenhithe Gas Company*—£50 stock yielded £36. *North Camp, Farnborough, and District Gas Company*—Fifty £10 shares realized £6 15s. each. *Rochester Gas Company*—Ten £50 shares produced £114 10s. each. *Chatham Water Company*—Four £5 shares fetched £15 7s. 6d. each.

The Oldbury Gas Undertaking and the Dispute in the Coal Trade.—Last Friday, at the meeting of the Oldbury Local Board, the report of the Gas Committee showed that they had purchased about 1000 tons of coal at increased rates during the recent strike in the coal trade. The Chairman (Mr. J. W. Wilson) said they hoped to get through the difficulty occasioned by the strike without any alteration in the price of gas. They had purchased about 1000 tons of coal at an average increase of 9s. per ton upon their contract rates; and, as far as they could see, they had passed through the trouble better than some other neighbouring districts, who had all booked their requirements at the high figures up to the end of December, and some as far ahead as January and February, in order to secure deliveries. His Committee decided to await the result of the conference, and did not purchase. The result was that they had only a fortnight's stock at the higher rates to use up after fresh coal came in. He estimated that the strike cost the Committee about £450, or 1¼d. per 1000 cubic feet of gas; but he thought it would not be necessary to raise the price.

A Large Village Water-Supply Scheme.—A public inquiry was opened by Major-General Crozier, R.E., at Evesham, on the 22nd ult., in reference to a scheme of water supply which the Rural Sanitary Authority of the Evesham Union are proposing to carry out. The Authority had applied to the Local Government Board for sanction to borrow £13,867 for the supply of the contributory places of Aldington, Aston Somerville, Badsey, Bretforton, Church Honeybourne, Cleeve Prior, Cow Honeybourne, Great and Little Hampton, Hinton, North and Mid Littleton, Pebworth, Broad Marston, Sedgberrow, South Littleton, Marston Sicca, and Wickhampford. Witnesses were called to prove scarcity of water; and the Engineer of the scheme (Mr. J. E. Willcox) explained that the principal source of supply was in the Broadway Hills, at what is known as the Pear Tree Springs. There was strong opposition to the project from some of the parishes named. The inquiry was adjourned until the 25th ult., when the evidence submitted by the opponents showed that they were of opinion that the scheme was too large, and the proposed source was insufficient. Various other sources were suggested.

A Successful Artesian Boring at Keighley.—Messrs. Holmes, Pearson, and Midgley, of Keighley, have reached a good supply of water, after boring through rock, &c., to a depth of about 243 feet. The supply is estimated at more than 8000 gallons per hour.

Issue of Additional Capital in the Lea Bridge Gas Company.—In accordance with the announcement which has recently appeared in our advertisement columns, Mr. Alfred Richards will offer for public competition to-morrow, at the Mart, Tokenhouse Yard, 300 £10 shares in the Lea Bridge District Gas Company; being part of the further additional share capital authorized by the Company's Act of 1878.

Increases in the Price of Gas.—The Darwen Gas Committee have decided to recommend the Town Council to advance the price of gas 3d. per 1000 cubic feet, from the 31st inst.; but this change is not to apply to gas supplied for cooking and heating purposes. It has also been decided by the Lancaster Corporation to raise the price in their district by 3d. per 1000 cubic feet. Alderman Hatch informed the Council last Wednesday that the extra cost of coal during the recent strike had amounted to £2000. The Birkenhead Gas Committee have resolved to recommend the Town Council to put on 4d. per 1000 cubic feet. The present price of gas is 3s., with an allowance of 3d.; making the net price 2s. 9d. The Committee estimated that they would hand over a sum of £5000 in aid of the rates; and the coal strike has, it is reported, so diminished the profit that this cannot be done without raising the price of gas to consumers. An addition of 3d. per 1000 cubic feet will be made in the price of gas at Nelson from the end of the current quarter.

Johannesburg Water-Works, Estate, and Exploration Company.—The Directors of this Company, in their report for the financial year ended June 30 last, state that the gross earnings amounted to £46,433; and the expenditure, to £22,543—leaving a profit of £23,890 for the year. Adding the balance of £6023, brought from the previous year, there is a total of £29,914. This amount has been apportioned as follows: Debenture interest to June 30, 1893, £4200; dividend No. 4 of 6 per cent., declared Jan. 29, 1893, £15,000; special charges incurred during the year, £7151; carried forward to next year, £3562. The Company have now a storeage capacity of upwards of 31 million gallons; and the yield from the springs is stated to have increased considerably. Dr. A. Simon reports that the water is of good healthy quality for drinking purposes; and the Engineer and Manager (Mr. G. R. Andrews) presents a detailed statement as to the Company's works. At the annual general meeting of the Company on the 1st ult., the adoption of the report was moved by the Chairman (Mr. B. I. Barnato) at the close of a long speech; and the motion was carried unanimously.

Suffocation by Coal Gas.—At the St. Giles's Coroner's Court last Friday, Dr. G. D. Thomas held an inquiry relative to the death of Mr. H. A. Pickenden (age 55), managing clerk to Messrs. Buckland, Surveyors and Auctioneers, who was found dead in a strong room in a house in Bloomsbury Square, W.C. Evidence was given by Mr. S. F. Murat, a fellow-clerk, to the effect that the habits of deceased were very regular and temperate. Witness had, however, noticed lately that Mr. Pickenden had been very depressed in spirits and drowsy; and he was aware that he was about to leave the office, which appeared to distress him. On the previous Monday, there was a strong smell of gas, and witness found that it proceeded from the strong room, which was in the basement. He went downstairs, opened the door, and found the gas-tap full on. The place being in darkness, he noticed nothing. On the following morning the deceased did not arrive at the office; and in the afternoon, witness went down to the basement to superintend the removal of some old furniture. He had to go into the strong room, and lighted the gas. Upon looking in the corner, he saw deceased lying on two chairs, and grasping a large bottle, half full of whisky, in his right hand. Dr. Samuel Lloyd, who had made a *post-mortem* examination, said that death was due to suffocation by foul coal gas. A verdict of "Found Dead" was returned.

Proposed New Gas-Works for Blackburn.—The Gas Engineer of the Blackburn Corporation (Mr. S. R. Ogden) has lately made a report to the Gas Committee on the past and future gas supply of the borough. It appears therefrom that during the last eight years the production of gas has been increased 55 per cent.; and in order to meet the augmented demand, it has been necessary to keep all the plant constantly in use, at considerable risk of a breakdown. Mr. Ogden's working margin is only about 500,000 cubic feet per day; and assuming a continuance of the increased consumption which has characterized the past few years, he thinks it will be difficult to keep up a satisfactory supply of gas during the coming winter. He gives details of a proposal to erect new works at Whitebirk, on a site so situated that the additional supply of gas required will be manufactured as near as possible to the area in which it will be consumed. This site lies between a railway and a canal; and consequently the cost of carting, representing about 1s. 6d. per ton of coal, will be saved. A further advantage presented by the site will be that it will afford room for future extensions. As soon as the new works are completed, there will be an immediate relief of the abnormal wear and tear on the existing plant, with the result that gas could be produced in the No. 2 works under ordinary conditions at a less cost than at present. By erecting the proposed new works, and putting up an electric light installation on the site of the present No. 1 works, the quantity of gas at present made in those works will be produced in the new works at a considerable saving in the cost of superintendence and labour, in addition to the saving of all expense of trimming and carting coal; thus reducing the extra cost per 1000 cubic feet, and for wear and tear. Mr. Ogden's report is accompanied by another made to the Committee by Messrs. Stevenson and Burstal, which corroborates his opinions, and agrees with him that the proposed works can be erected within the estimated cost of £158,329. Action is about to be taken on these reports, for last Friday Major-General H. D. Crozier and Mr. E. P. Burd held an inquiry in regard to an application made to the Local Government Board by the Corporation for power to borrow additional money to enable them, among other things, to carry out the scheme.

The London County Council and their Expenditure.—In order to get over the difficulty in which the London County Council sometimes find themselves placed, owing to their inability to spend money without the special sanction of Parliament, it is stated that it is their intention to insert, in future Money Bills, a clause enabling them to lay out £50,000 a year upon matters "not specifically provided for." As a contemporary remarks, "a nice little sum to play with."

Local Authorities' Liabilities for the Maintenance of Highways.—In the Court of Appeal, on the 24th ult., before Lords Justices Lindley, A. L. Smith, and Davey, judgment was given in two appeals by the Horsham Local Board and the Brighton Corporation respectively against decisions of a Divisional Court affirming the judgment of a County Court Judge, who had awarded damages to persons claiming from the defendants on account of accidents that had happened to horses through defects in gratings and manholes in highways under the defendants' control. In both the Courts below it had been held that the defendants' double capacity as road authority and sewer authority rendered them liable; but their Lordships now held that, according to decisions of the House of Lords, the defendants were not liable. As, however, in their Lordships' opinion, the state of the law on the subject is unsatisfactory, while allowing both the appeals, they refused costs.

The Auxiliary Water Supply for Leicester.—At last Tuesday's meeting of the Leicester Town Council, the Water Committee presented a report as to the agreement they have entered into for a supplemental supply of water from the Ellistown Colliery pumping-shaft. The available quantity of water is estimated at 390,000 gallons per day; and as a substantial capital outlay will be involved, the proprietors have agreed to grant a lease for a term of 30 years, from Jan. 1 next, at an annual rental of £500. The agreement also includes a provision authorizing the Corporation, under certain circumstances, to put an end to the arrangement, within two years, on payment of £2000 as liquidated damages. A number of clauses are also inserted safeguarding the Corporation. It is estimated that this supply will only cost ¾d. or 1d. per 1000 gallons. The Committee were authorized to apply the reserve fund to the execution of the necessary work in connection with this supply.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1030.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Oct.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	„	7½	Do. 7 p. c.	10	11½—12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	102—104	..	4 16 2
100,000	20	31 May	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	15 Nov.	6½	Bombay, Limited	5	5¼—5⅜	..	5 13 0
40,000	5	„	6½	Do. New	4	3⅞—4¼	..	5 13 0
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	220—225	..	5 2 2
180,000	„	„	8½	Do. New	100	163—168	..	5 1 2
220,000	20	15 Sept	11½	Brighton & Hove Original	20	41—43	+1	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	102—105	..	4 15 3
320,000	20	29 Sept.	11½	British	20	42—44	..	5 4 7
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	„	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5⅝—6¼	—½	3 1 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	98—101	..	5 18 10
150,000	20	13 July	8	Cagliari, Limited	20	27—28	..	5 14 3
550,000	Stck.	13 Oct.	12½	Commercial, Old Stock	100	244—249	..	5 0 4
165,000	„	„	9½	Do. New do.	100	187—192	..	4 19 0
160,762	„	15 June	4½	Do. 4½ p. c. Deb. do.	100	125—130	..	3 9 3
800,000	Stck.	15 June	13	Continental Union, Limited	100	230—235	..	5 10 7
200,000	„	„	10	Do. 7 p. c. Pref.	100	193—198	+2	5 1 0
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	285—290	..	5 5 3
486,090	10	28 July	10	European, Limited	10	21—22	..	4 10 1
354,060	10	„	10	Do. Partly paid	7½	14½—15½	..	4 17 10
5,646,590	Stck.	16 Aug.	12	Gaslight & Coke, A, Ordinary	100	230—235	+3	5 2 1
100,000	„	„	4	Do. B, 4 p. c. max.	100	97—102	..	5 18 5
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	273—278	+10	3 11 11
30,000	„	„	5	Do. F, 5 p. c. Prf.	100	135—135	+7½	3 14 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	185—190	..	3 18 11
1,300,000	„	„	7	Do. H, 7 p. c. max	100	173—178	..	3 18 7
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	270—275	+7	3 12 9
476,000	„	„	6	Do. K, 6 p. c. Prf.	100	162—167	+5	3 11 10
1,061,150	„	15 June	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	„	„	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	„	„	6	Do. 6 p. c. do	100	177—182	+2	3 5 11
3,800,000	Stck.	15 Nov.	12	Imperial Continental	100	215—220	+2	5 9 1
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	4¾—5¼	..	5 14 3
560,000	100	2 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	105—107	..	4 13 5
541,920	20	15 Nov.	5	Monte Video, Limited	20	12¾—13½	..	7 8 2
150,000	5	30 Nov.	8	Oriental, Limited	5	6¾—7¼*	..	5 10 4
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4½	..	7 15 6
166,870	10	—	2	Para Limited	10	1½—2	..	—
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	1 Dec.	6	2nd Do.	100	96-100*	+1	6 0 0
150,000	10	13 Oct.	5	San Paulo, Limited	10	8¾—9½	..	5 5 3
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	304—309	+2	5 0 4
1,350,000	„	„	12	Do. B do.	100	242—247	..	4 17 2
260,000	„	„	13	Do. C do.	100	255—260	..	5 0 0
750,000	„	13 July	5	Do. 5 p. c. Deb. Stk.	100	148—152	..	3 5 9
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	210—215	..	5 7 9
				WATER COMPANIES.				
744,897	Stck.	29 June	10	Chelsea, Ordinary	100	270—275	..	3 12 9
1,720,252	Stck.	13 Oct.	8	East London, Ordinary	100	208—213	..	3 15 1
544,440	„	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—143	..	3 2 11
700,000	50	15 June	8½	Grand Junction	50	110—115	—½	3 13 11
708,000	Stck.	16 Aug.	11	Kent	100	285—290	+1	3 15 10
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	242—247	..	3 16 11
406,200	100	„	7½	Do. 7½ p. c. max.	100	199—204	..	3 13 6
310,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	128—131	..	3 1 0
500,000	100	16 Aug.	12½	New River, New Shares	100	337—342	+2	3 10 11
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132—135	..	2 19 3
902,300	Stck.	15 June	6	S'thwk & V'xhall, 10 p. c. max.	100	155—160	..	3 15 0
126,500	100	„	6	Do. D 7½ p. c. do.	100	145—150	..	4 0 0
1,155,066	Stck.	15 June	10	West Middlesex	100	264—269	..	3 14 4

*Ex Div

Additional Capital for Wigan Water-Works Purposes.—The Water Committee of the Wigan Corporation have exhausted their borrowing powers; and they have decided to ask the Town Council to sanction an application to the Local Government Board for permission to raise further capital to the extent of £12,000.

Newhaven and Seaford Water Company.—The annual meeting of this Company was held last Tuesday. It was reported that the profit for the year ending Sept. 29 was £1027; and that the disposable balance was £1013. From this a dividend at the rate of 5 per cent. was declared. It was stated, in the course of the proceedings, that the Directors had been advised by their Consulting Engineer (Mr. Easton) to construct a new well, 5 feet in diameter, in proximity to the old one, the two to be connected by a tunnel.

The Birmingham Water Scheme.—Last week the Chairman of the Birmingham Corporation Water Committee (Mr. Alderman Lawley Parker) communicated to the press a few particulars regarding the work that is to be immediately undertaken in connection with their new watershed at Rhayader. The principal work now in progress is the railway which is to connect the workmen's village with the town of Rhayader, a distance of five or six miles, and which it is believed will be completed in May. Already over 100 men are employed on the watershed; and four or five engineers are busily engaged taking levels and preparing for the various works. Possession of the land which will be wanted early has been obtained; so that the Corporation have all that is now really necessary so far as the reservoirs and other work are concerned. Quarrying is going on apace, so as to have a large supply of stone ready by the time it is required for use in the construction of the dams. A considerable quantity of machinery is also being erected. In regard to the village itself, active preparations are being made for the accommodation of the workpeople. It will ultimately be necessary to provide two villages; but at the present time only one is in course of development. This will be divided into one or two streets; and there will be wooden erections which altogether will provide accommodation for 1000 persons, 500 of whom will be navvies or other workmen. There will be a hospital for the reception of accidents; and a resident medical officer and a staff of nurses will have to be appointed. The village will be properly sewered; and a water supply will be obtained from the mountains. A school-room, public hall, reading-room, infectious diseases hospital, and other minor buildings are to be erected; and altogether everything possible is being done to make the workmen comfortable.

A Water Supply for Ackworth from Pontefract.—Colonel Ord Halstead, R.E., was engaged last Wednesday in inquiring into an application, by the Hemsworth Rural Sanitary Authority, for the sanction of the Local Government Board to a loan of £4400 for the purpose of carrying out a water scheme for Ackworth. The Authority, it was stated, had been successful in negotiating for a supply from the Pontefract Corporation.

The Supply of Coal.—Although operations have been resumed at most of the pits which were stopped by the colliers' strike, yet many gas-works are still without any considerable stock of coal. Deliveries have greatly improved; but at this season the demand is heavy, and the quantities which come to hand are very little in excess of the requirements from day to day. This fact was commented upon at the meeting of the Rochdale Gas Committee last week, when it was stated that, although delivery was being made under the contracts, the stock on hand was only sufficient to last two or three days. Any lengthened period of foggy weather, which while delaying railway transit would increase the demand for gas, is therefore likely to cause gas managers a renewal of the difficulties which were experienced during the later weeks of the miners' strike.

Water Supply of Belgrade.—According to a recent report of the British Vice-Consul at Belgrade upon the trade of Servia last year, Belgrade was provided with a supply of water from a spring known as the "Bela Voda," or "white water," situated about five miles from the capital, and close to the extensive marshes of Makish, whose waters are said to be prevented from mixing with that of the springs by the intervention of a stratum of impenetrable clay. Two wells have been sunk to a depth of from 65 ft. 7½ in. to 82 ft. These wells lead into a main tank, from which the water is pumped through pipes into the reservoirs of Belgrade. The reserve supply of water at command is stated to amount to 75 per cent.; and the pumps are arranged to give a pressure of from 15 to 24 atmospheres, but only from 7 to 8 are necessary at present to force the water into the Vrachar reservoir, which stands at a height of about 262 feet. The pumps can be worked from 20 to 22 hours out of the 24, and can supply 66,000 gallons per hour, so as to fill the reservoir in five hours. In addition to the construction of the new water-tanks, the old conduits have been repaired, and hydrants placed in the streets of the town at intervals of 492 feet but the pressure from these hydrants is too great to allow of their being used to water the streets—the rush of water carrying away the sand in which the paving-blocks are embedded.

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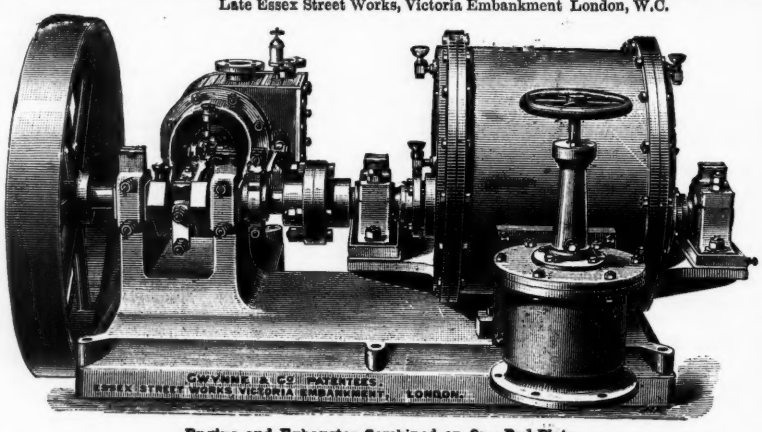
The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
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JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
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Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield
AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 1060 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

LIQUOR, Tar, and Spent Oxide wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, SCOTLAND.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works sundries. (See last week, p. 969).
Telegrams: "HUTCHINSON BROS., BARNSLEY."

WANTED, a Situation as Working Gas Manager, used to Engine and Exhauster. Can use all Tar made for firing Retorts, lay Mains and Services, fix Meters, take Indices, and do his own Mechanical Repairs upon the Works.
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WANTED, by a young Man (age 23), a Situation as ASSISTANT in a medium-sized Gas-Works. Five years' experience in modern Works (Regenerator Furnaces). Well up in Photometer work and Testing of every kind. Honours in Advanced Grade, City and Guilds of London Examination in Gas Manufacture.
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WANTED, Two or Three Travellers with undoubted connections with Gas Companies. Say in what part of England connection exists, and Salary required.
Apply, by letter, stating experience and full particulars, to No. 2305, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKSHOP Manager wanted. Energetic and enterprising man, acquainted with Gas Apparatus from the Retort to the Burner, good Draughtsman and Correspondent, and able to design new Apparatus.
Applications (which will be held as strictly confidential) must contain brief particulars as to experience, present occupation, salary, and age.
Address Box 1660, Sell's Advertising Offices, LONDON.

WANTED. Gas Liquor.
Address GEORGE DOBSON, LIMITED, CARDIFF.

WANTED, to purchase, for immediate delivery, 300 to 400 tons of SPENT OXIDE, containing from 50 per cent. to 60 per cent. of Sulphur.
Apply, by letter, to No. 2306, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a set of four second-hand PURIFIERS, 12 or 14 feet square, with Centre-Valve and Lifting Apparatus. Also a STATION METER, 15,000 or 20,000 cubic feet capacity hourly.
Full particulars to be sent (by letter) to No. 2308, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WATER-WORKS.

THE Valuable Property and Undertaking of the GUERNSEY WATER-WORKS COMPANY, LIMITED, will shortly be offered FOR SALE. Further Particulars will be announced later.
J. D. A. NORRIS, Receiver, Manager, and Liquidator, Suffolk House, Laurence Pountney Hill, LONDON, E.C.

THE Directors of the Worksop Gas Company invite TENDERS for the purchase of the surplus TAR and the AMMONIACAL LIQUOR made at their Works from the 1st of January to the 31st of December, 1894.
Tenders for Tar to state price per ton, delivered into Purchaser's Tanks, at Worksop Railway Station.
Tenders for Liquor to state price per ton, as tested by No. 1 Twaddel's Hydrometer, delivered into Boats near Company's Works.
The Directors do not bind themselves to accept the highest or any tender.
Tenders to be sent in by the 23rd inst.
Worksop, Dec. 3, 1893.

PATENTS, DESIGNS, AND TRADE MARKS.

INVENTIONS Protected by Letters Patent. TRADE MARKS REGISTERED at home and abroad. Advice on all questions relating to above. Handbook gratis.
Apply to J. C. CHAPMAN, Chartered Patent Agent, 70, Chancery Lane, LONDON.

G. L. LAMBERT, 26, Alberta Terrace, Nottingham. Consultations, Advice, Reports in Various Branches of **Practical** Mechanical Engineering and Machinery. **Specialities** in Water, Sewage, and Gas Plant Making. **Surveyor** of Steam-Ships, Marine Engines, Boilers, and General Machinery. **Detailed Inspection** of Engineering Contracts during Manufacturing and Erection.

TO GAS AND WATER COMPANIES AND MANAGERS.

AN ASSOC.M.INST.C.E. having an extensive experience in GAS and WATER WORKS' DESIGN and ERECTION, now Chief Assistant in a large Gas-Works and Engineer to several small ones, having designed and erected a THREE HUNDRED and a ONE HUNDRED MILLION GAS-WORKS complete, besides several small ones, also ENLARGED many other Works, including NEW LIFTS to EXISTING GASHOLDERS, REGENERATIVE SETTINGS, &c., would be pleased to VISIT WORKS and ADVISE on their EXTENSION or ALTERATION, making SPECIFICATIONS, DRAWINGS, ESTIMATES, and superintend erection if desired.
SPECIALITIES.
Any EXTENSION or ALTERATION to GAS or WATER WORKS. ASSESSMENT of Gas-Works. New HOLDERS, TANKS, ROOFS, PURIFIERS, or FILTER-BEDS. TELESCOPING or adding FRESH LIFTS to EXISTING HOLDERS. REGENERATIVE SETTINGS, for SMALL GAS-WORKS, without Excavations. SAVING 20 PER CENT. in first cost, renewals, and working.
Address "Boz," 9, Gracechurch Street, LONDON, E.C.

GAS SHARES FOR SALE.

THE original Holder of 300 Shares in a recently incorporated Midland Gas Company offers the same FOR DISPOSAL.
For full Particulars and Price, apply to No. 2307, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF BURTON-UPON-TRENT.

FIRE-CLAY GOODS.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the supply of the FIRE-CLAY RETORTS, BRICKS, and CLAY required at the Gas-Works during the Year 1894.
Full Particulars of the Specification and Conditions, with Form of Tender, may be obtained on application to the undersigned, to whom sealed tenders, endorsed "Fire-Clay Goods," must be delivered on or before Saturday, the 23rd day of December inst.
The lowest or any tender will not necessarily be accepted.

F. L. RAMSDEN,
Manager and Engineer.
Gas-Works, Burton-upon-Trent,
Dec. 1, 1893.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS of this Company, so far as they relate to Debenture Stocks and Bonds, WILL BE CLOSED at One o'clock p.m., on Saturday, the 9th prox., for the Half Year ending on the 31st prox., and will be re-opened on the Morning of Monday, the 11th prox.
The interest for the Half Year will be payable, on the 1st of January next, to the Proprietors registered on the closing of the Books.

By order,
J. W. FIELD,
Secretary and General Manager.
Chief Office: Horseferry Road,
Westminster, S.W., Nov. 28, 1893.

Now Ready, Price 15s., Limp Cloth, the Thirteenth Yearly

ANALYSIS OF THE ACCOUNTS
OF THE
Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the year ended December 31, 1892, or March 31, 1893, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the year ended December 31, 1892.

Compiled and arranged by
ALFRED LASS, F.C.A.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence Invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

EAST LONDON WATER-WORKS COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS in respect to the Debenture Stock WILL BE CLOSED on the 18th of December inst., and re-opened on the 1st day of January, 1894.

By order,
I. A. CROOKENDEN,
Secretary.
St. Helens Place, London,
Dec. 9, 1893.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

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ISSUED BY
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ALL PARCELS SENT CARRIAGE FREE.

HANDBOOK FOR GAS ENGINEERS AND MANAGERS. — By THOMAS NEWBIGGING, M.Inst.C.E. Fifth Edition, enlarged, and illustrated by 193 engravings. Prices: Bound in morocco, gilt edges, 18/-; cloth, 15/-.

PRACTICAL PHOTOMETRY: A GUIDE TO THE STUDY OF THE MEASUREMENT OF LIGHT.—By W. J. DIBDIN, F.I.C., F.C.S., Chemist and Superintending Gas Examiner to the London County Council. Price 7/6, cloth, bevelled boards.

THE TRANSPORT OF MATERIAL FOR GAS-WORKS, ILLUSTRATED BY PLANS OF THE YORK, NEWCASTLE-UPON-TYNE, AND BECKTON GAS-WORKS.—By V. WYATT, formerly Constructing Engineer to The Gaslight and Coke Company. Price, in paper cover, fcap. folio, 2/6.

Complete List of Publications on Application.

Now Ready, Cloth Bound, Price 3s. 6d., Post Free,

THE ROYAL COMMISSION on the METROPOLITAN WATER SUPPLY.

— 1892-3. —

Report of the Evidence (reprinted from the JOURNAL), with Comments on the Inquiry, and the Commissioners' Conclusions and Recommendations.

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ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS
Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5 7, or 9 hours.

48, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

COKE BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT.)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
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TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 Candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cubic feet.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

MEIKLEJOHN'S PATENT
Improved Slide-Valve Anti-Dip.
Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
Further particulars and price from
C. MEIKLEJOHN,
GAS-WORKS, RUGBY.
(Late N. MEIKLEJOHN, Longwood.)

HUNTER'S
OXIDE OF IRON.
JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.
This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
Samples and Prices on application.
11, BAY STREET, PORT GLASGOW.
Telegrams: "HUNTER PORT GLASGOW."
Established 1872.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works
(also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers and rendering leakage impossible.

T.B.KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T.B.KITTEL, SHEFFIELD.

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SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON AND COAL COMPANY, Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]
TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The
WEARDALE IRON & COAL COMPANY, LTD.
GENTLEMEN,
For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.
Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	PER CENT.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE NEWCASTLE-ON-TYNE.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

For **FIRE-BRICKS,** the most durable for **GAS-FURNACES,**
Address
JAMES WHITE & Co., Limited,
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TAR AND LIQUOR PURCHASED.

JOHN CLARKSON MAJOR,
(Established 1851,)
Tar Distiller and Manufacturing Chemist,
WOLVERHAMPTON.
SCULCOATS HULL.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.,
Output about 3000 tons per day.

Analysis—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
Fitter.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

For Prices and Particulars, apply to
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THE SILICA FIRE-BRICK COMPANY,

OUGHTYBRIDGE, NEAR SHEFFIELD.
Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.
MANUFACTURERS OF

SILICA FIRE-BRICKS,

(TRADE MARK "SILICA")
Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.
BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.
Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

JONAS DRAKE & SON,

TELEGRAPHIC ADDRESSES:
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"ECLAIRAGE, LONDON"

TELEPHONE No. 43.
HALIFAX EXCHANGE.

GAS ENGINEERS,
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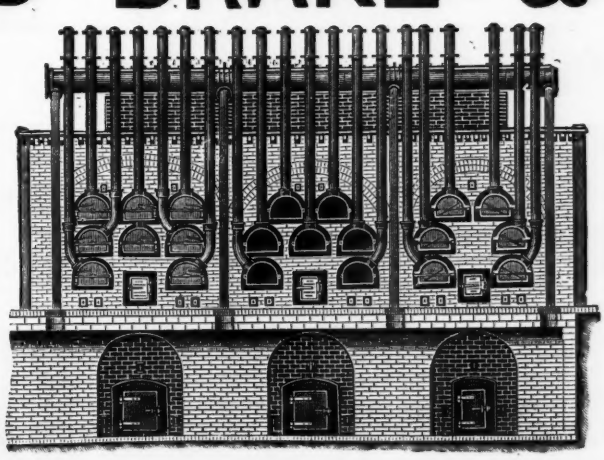
IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



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FURNACE BUILDERS
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REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

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	ALDER & MACKAY.	W. & B. Cowan.	G. Glover & Co.	James Keith.	D. B. Peebles & Co.
Total of Fast Tests . .	47·2	6·9	33·6	62·3	53·7
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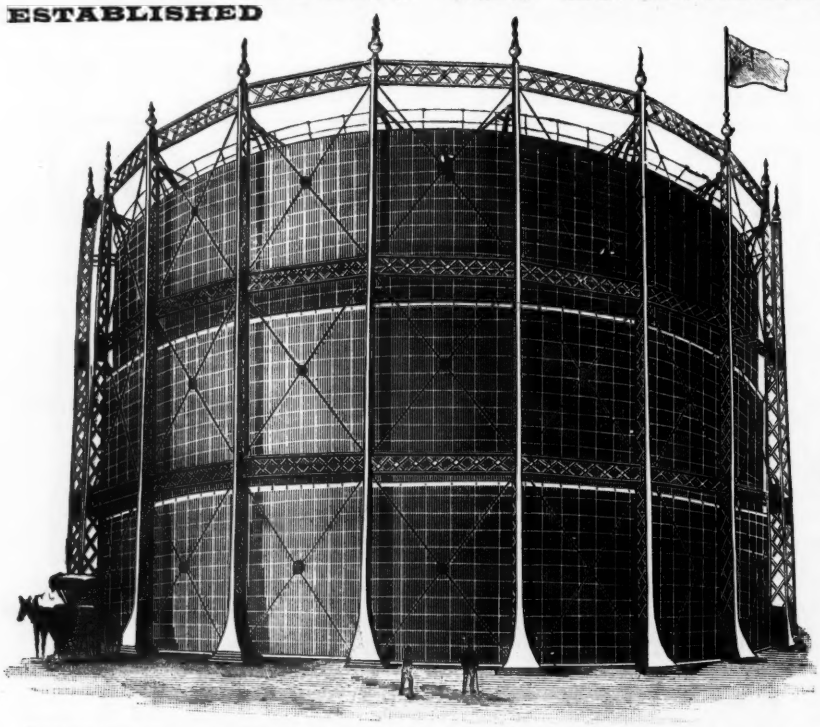

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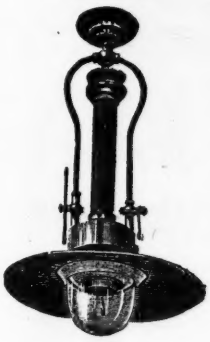

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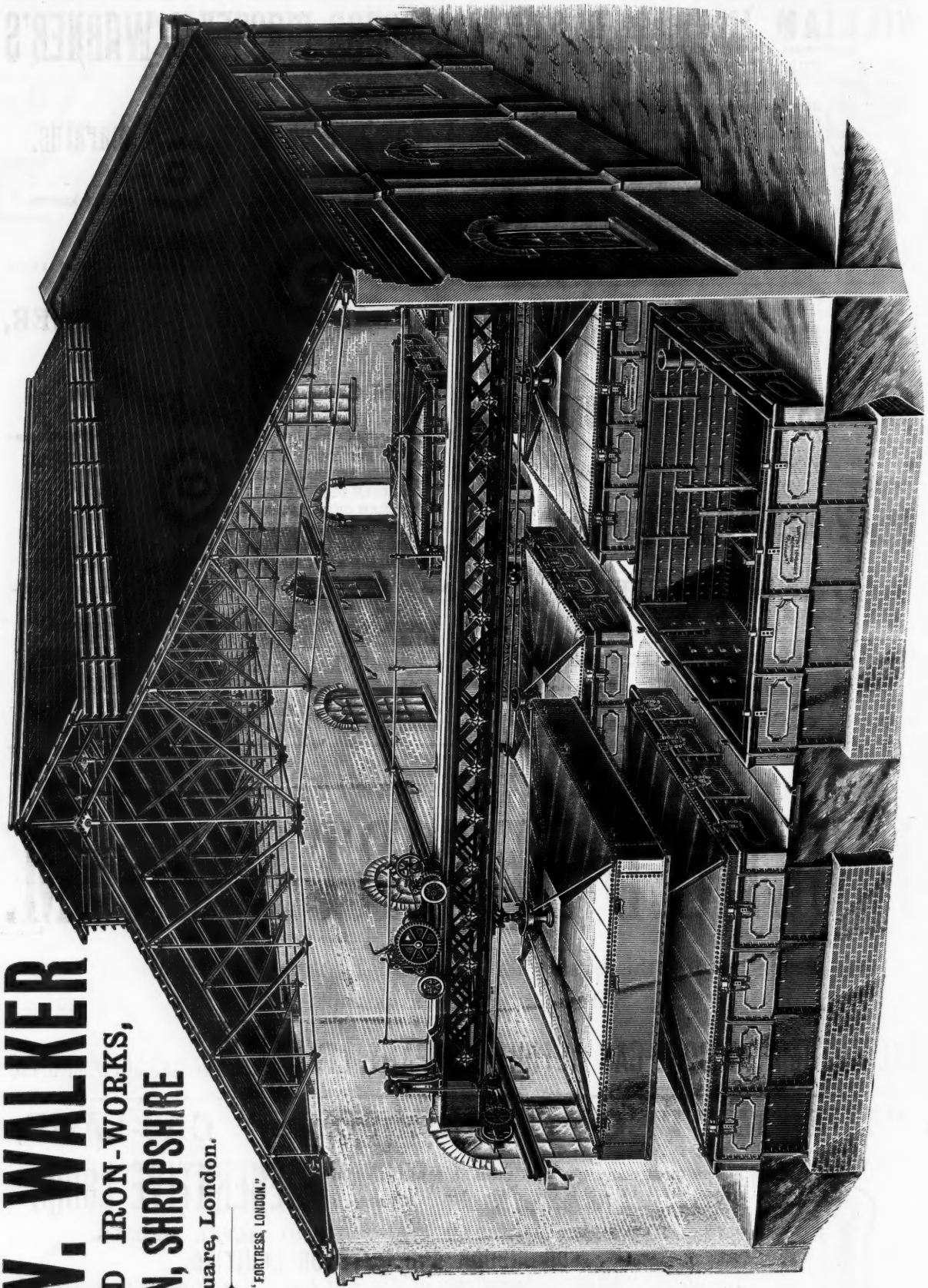

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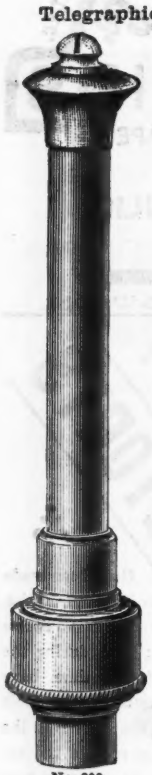

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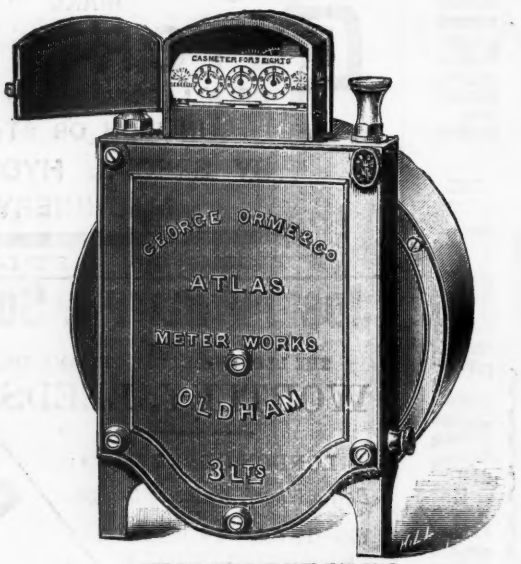
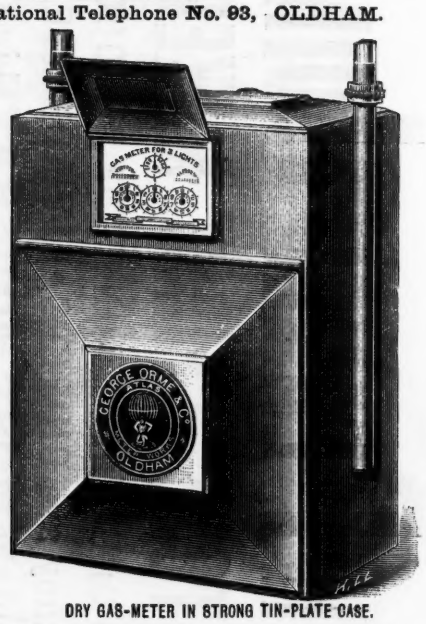


WET GAS-METER IN CAST-IRON CASE.



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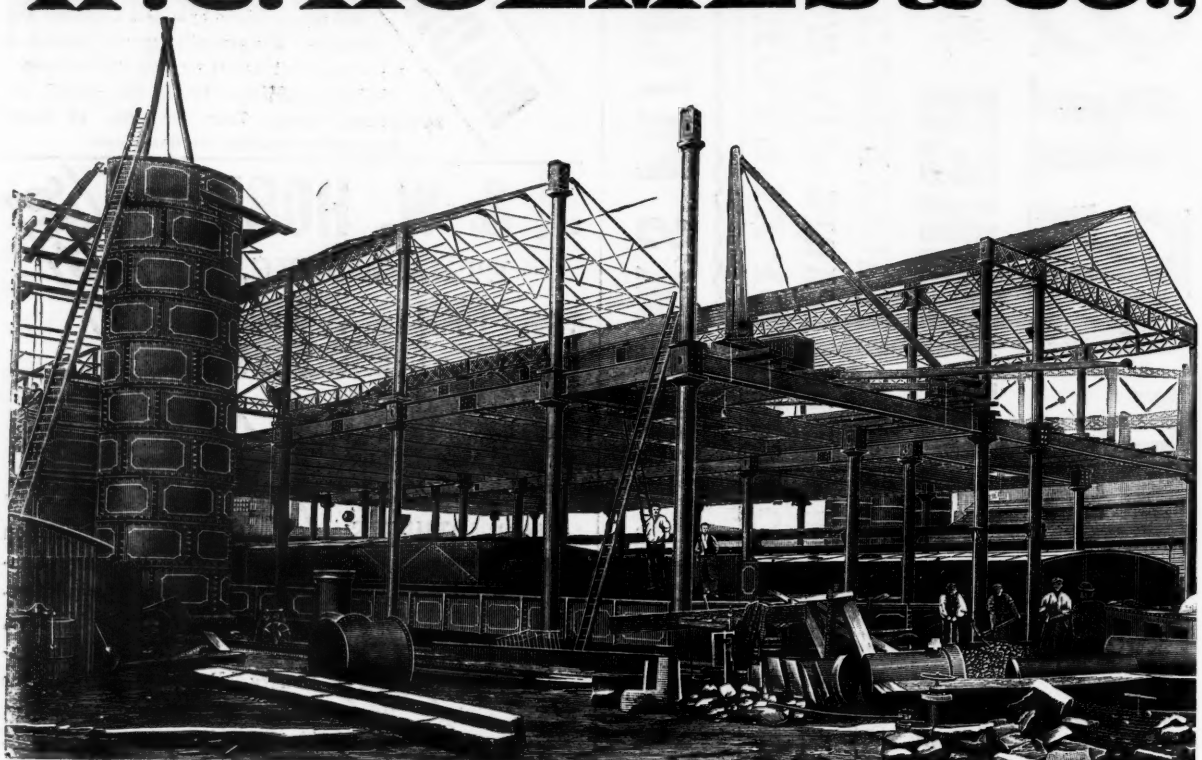

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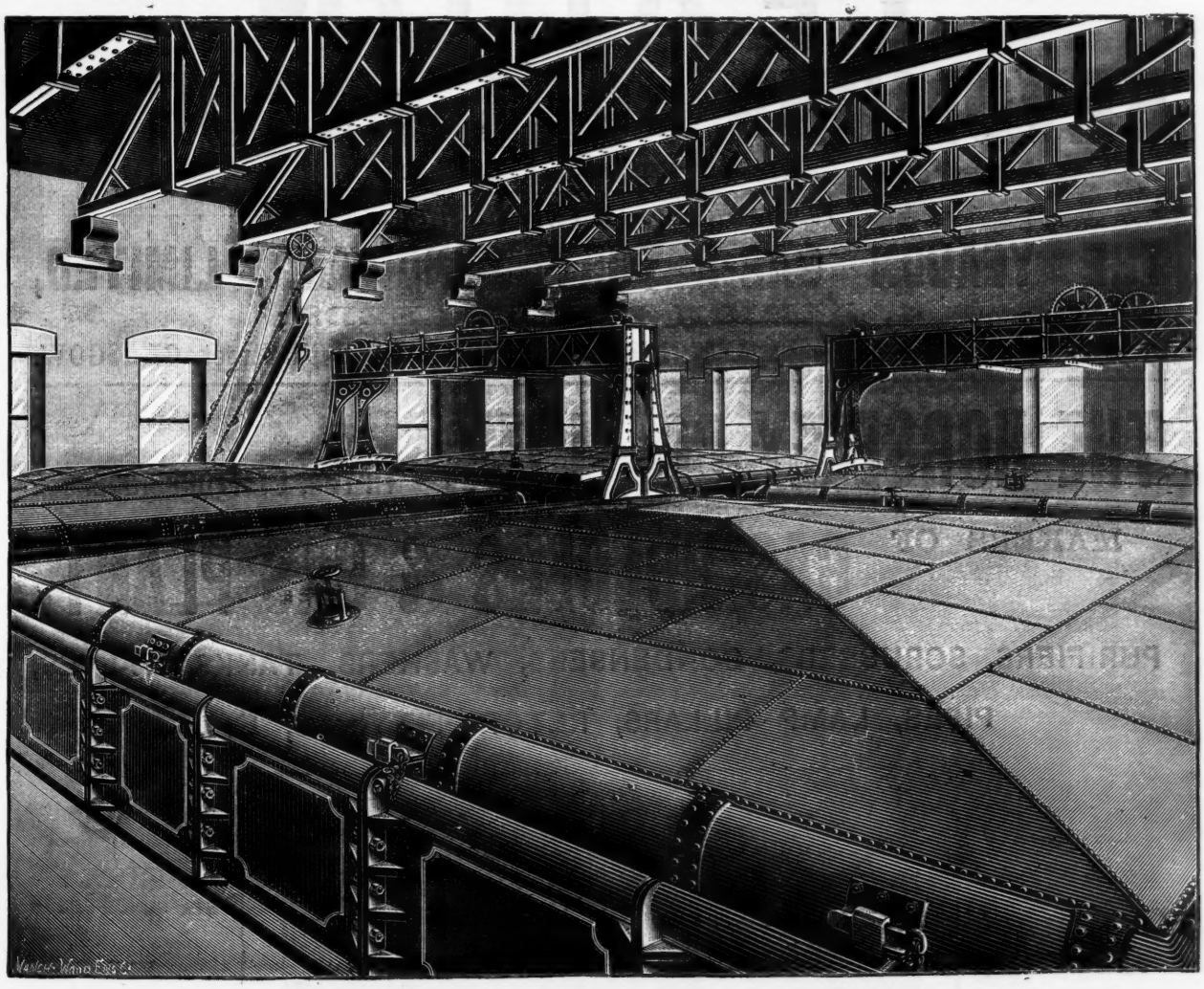

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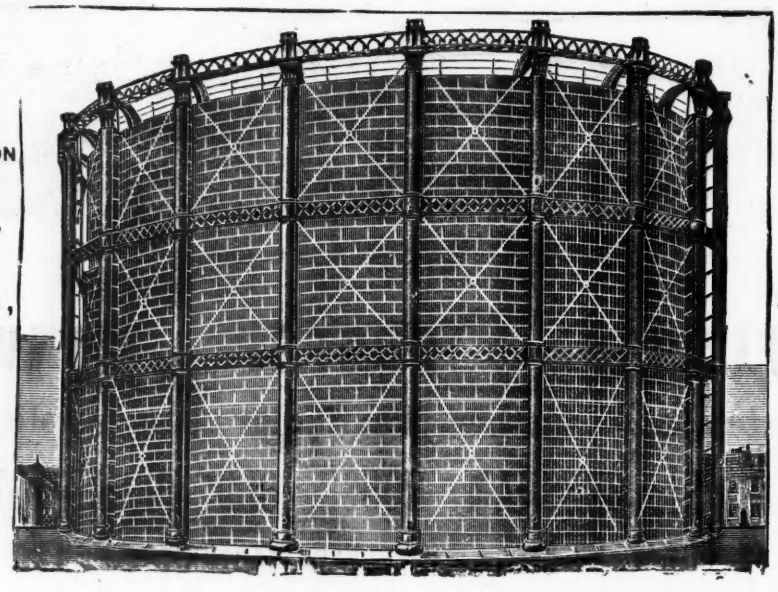

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Absolutely the Cheapest, Simplest, and most Economical Lamp before the Public.

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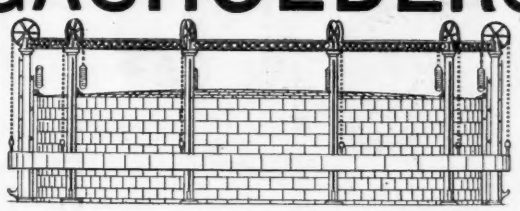

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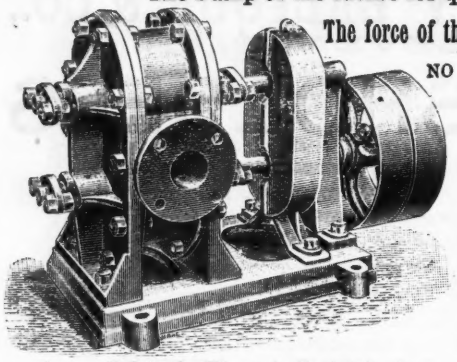

As supplied to the Harrogate Gas-Works for Pumping Gas Liquor.

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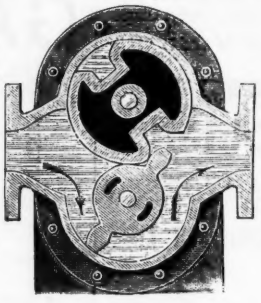

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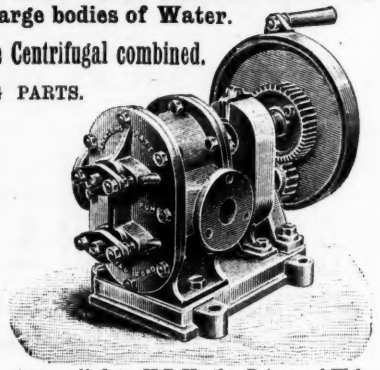

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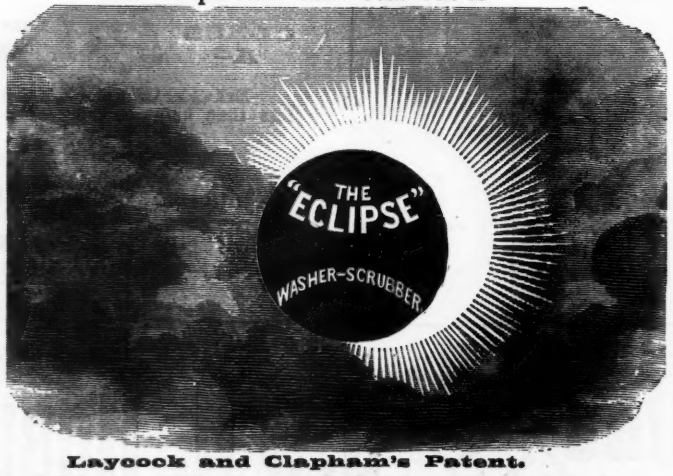

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Whilst the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

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